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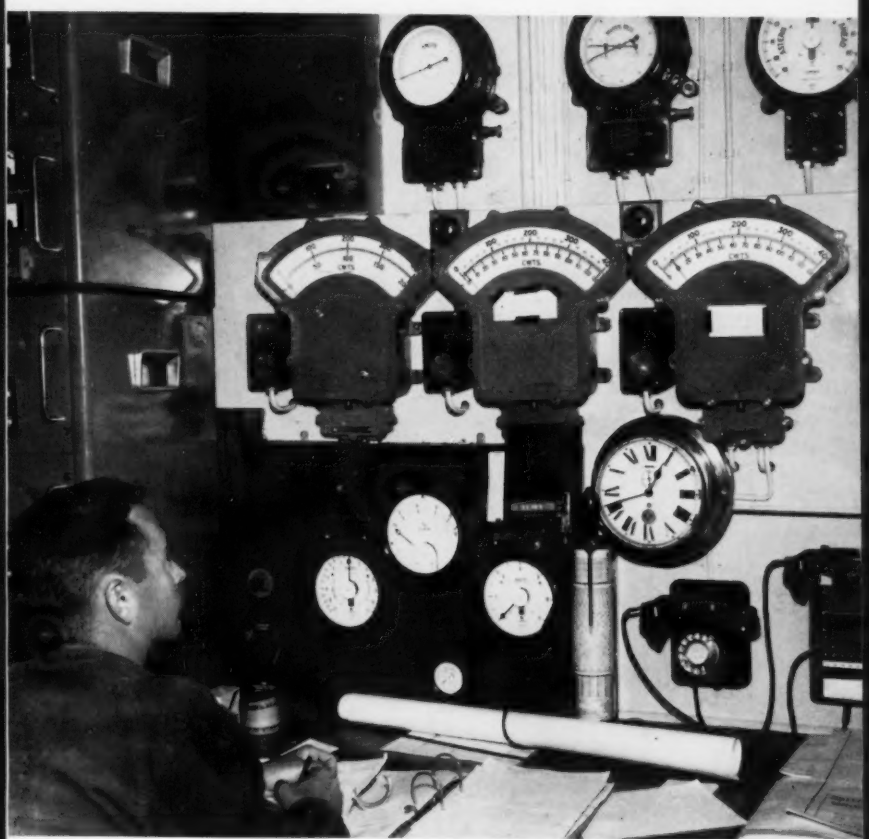
ELECTRICAL WEST

October 1956

25 Cents

SPOKESMAN FOR THE MOST HIGHLY ELECTRIFIED REGION OF THE U. S.



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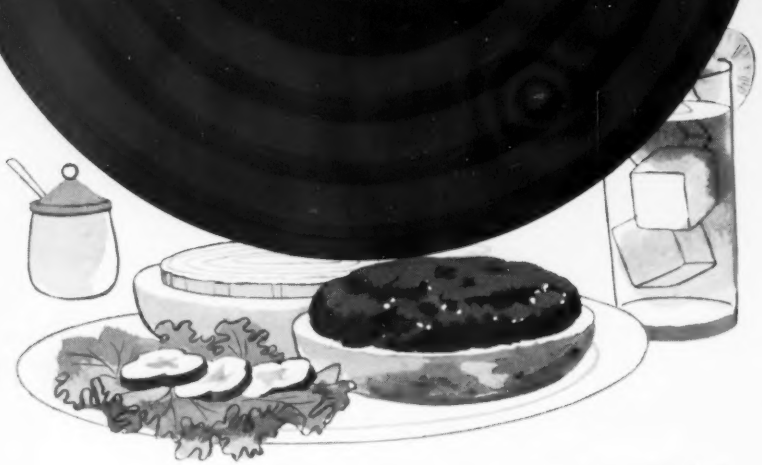
Edison
is demonstrating
the speed of
electric cooking...
to speed up
your
electric range
sales

Electric cooking is fastest!



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"deliciously done"
in 2½ minutes—
when you
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TODAY NOTHING COOKS FASTER than a modern electric range. From a cold start with a cold pan, hamburgers are ready to eat in 2½ minutes. Hot soup takes 68 seconds. Bacon and eggs 3½ minutes. Fry, bake, broil or roast – electricity does it better.

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When all cost factors are considered, Smoot-Holman's Perfect Vision indirect luminaire will be the choice for commercial, school and institutional lighting requirements. Its revolutionary "new as tomorrow" design gives more light per dollar than ever thought possible . . . yet continues Smoot-Holman leadership in quality and efficiency.

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THE ALL-INDUSTRY MAGAZINE OF PROGRESS, ESTABLISHED 1887,
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Next Month

The November issue again will carry the Directory of Manufacturers, used as a reference throughout the year. It lists manufacturers of electrical equipment and shows their principal Western offices and sales representatives. Features in the regular section will include an article on simplified wiring diagrams and one on system loading. NECA and NAED meetings held in the West will be reported.

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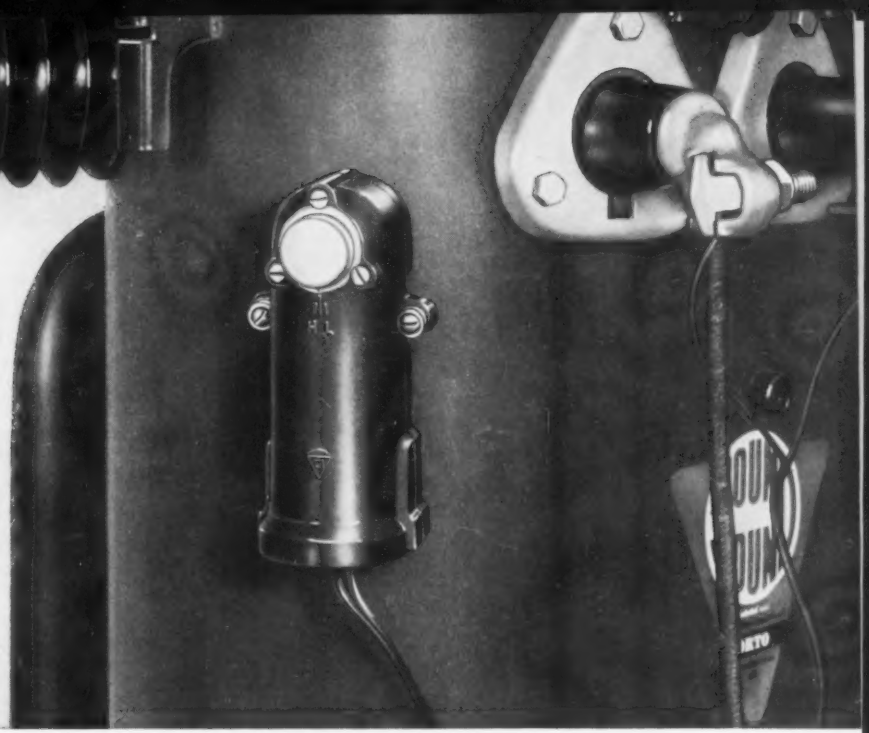

For mounting on transformers already in service, Alnico permanent magnet holds overload indicator on transformer tank. It will not creep or vibrate loose. The device provides an accurate yet economical overload indication.

New L-M Thermal Overload Indicator Easy To Install; Provides Constant Check

Simply attached and held by permanent magnet; provides continuous overload check; avoids service interruptions.

All you have to do is place the L-M thermal overload indicator against the transformer tank already in service, and it is installed. An Alnico permanent magnet holds the indicator firmly against the transformer tank. The indicator will not creep or vibrate loose. On new L-M Round-Wound® transformers the indicator is attached to a bracket permanently welded to the transformer tank.

This new device provides visible indication of overloads on conventional transformers up to 50 kva by means of a drop-down red light or drop-down luminescent tube. The luminescent type is provided with a nylon cord which can be attached to a cover bolt or other convenient projection to prevent the indicator from falling in the event the pole receives a severe shock.

Continuous Overload Check Without Interrupting Service

The L-M overload indicator provides an economical and reliable solution to load-study problems. It enables you to keep a continuous overload check on your distribution load and also eliminates the costly and laborious work required to take spot load checks.

In addition, the indicator on a conventional transformer does not interrupt service. It serves as a tool to reduce transformer burnouts and maintain service continuity by indicating serious overloads before they can cause trouble.

Compensates For Ambient Temperatures

The overload indicator measures tank-wall temperature (a function of top oil and hot spot temperatures), and makes proper allowance in transformer loading for variations in ambient temperature. Accuracy is sufficient for all practical purposes.

Indication Easily Seen

The overload indicator is available with a red light or reflecting tape. Both types are exceptionally brilliant and easily distinguished in daylight as well as at night. Indicator with red light requires an electrical connection to the transformer.

Indicating target is easily seen during the day or night. It is quickly and easily reset by simply pushing the indicating tube up.

Get Complete Information

L-M overload indicators are available for mounting on transformers in service, with permanent magnet, or stainless steel wire to wrap around tank. On new L-M Round-Wound transformers, indicator is attached to a bracket permanently welded to the transformer tank. Ask the L-M Field Engineer for bulletins and complete information. Or write Line Material Company, Protective Equipment Division, Milwaukee 1, Wis.

272

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dependable service under all operating conditions

here are a few of the quality products in the complete line of KEARNEY Disconnects

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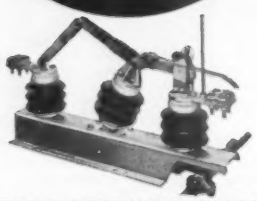
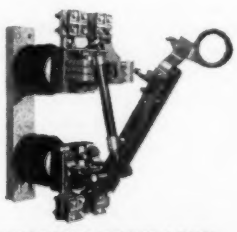
Product pioneering, however, is a two-way street. And we never forget it. KEARNEY's reputation rests on the fact that it has always worked so closely with its customers ... and planned with them for the years ahead.



KEARNEY TILTING INSULATOR GROUP OPERATED SWITCH

KEARNEY THREE-POINT SWITCH



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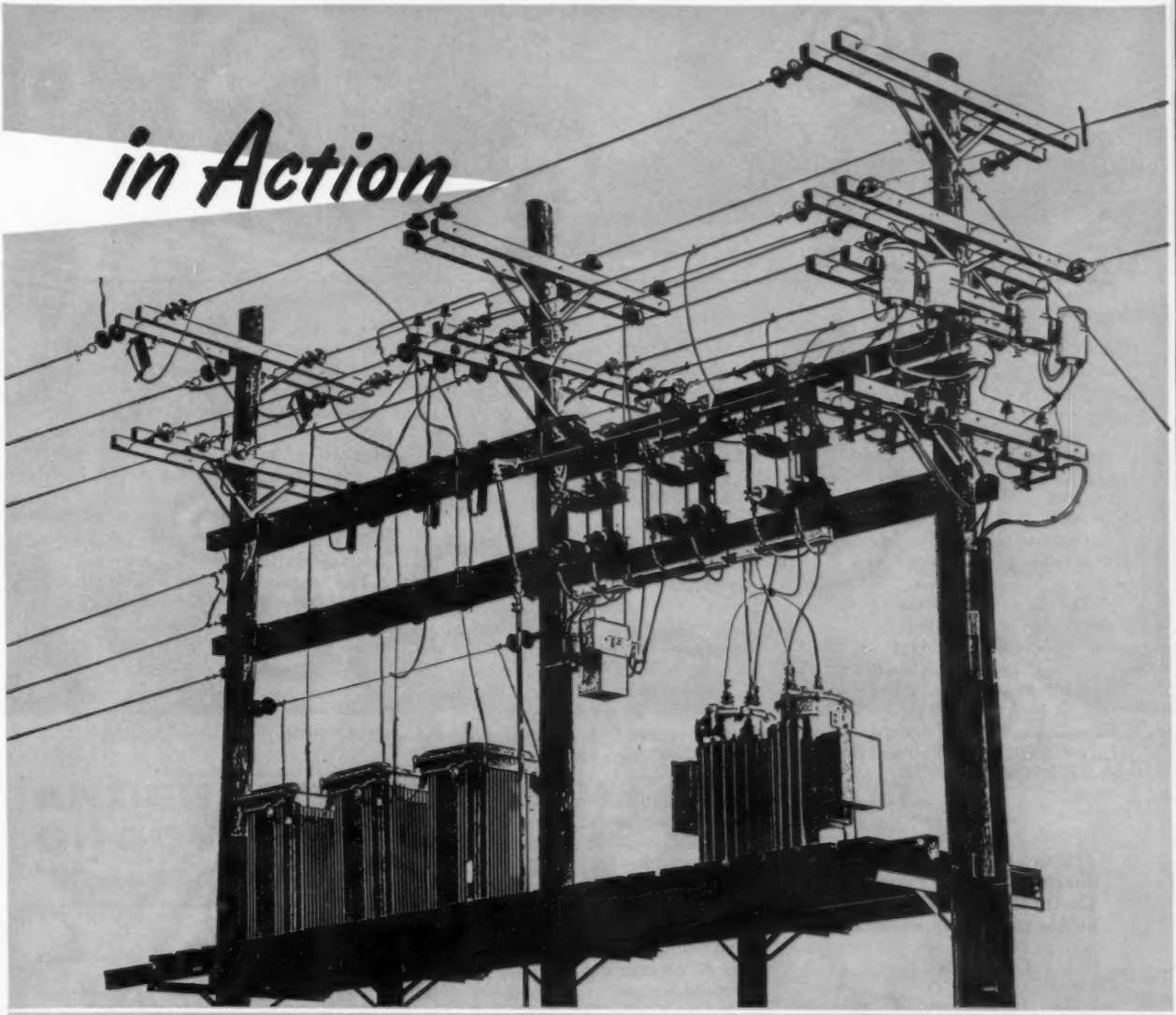

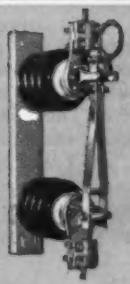

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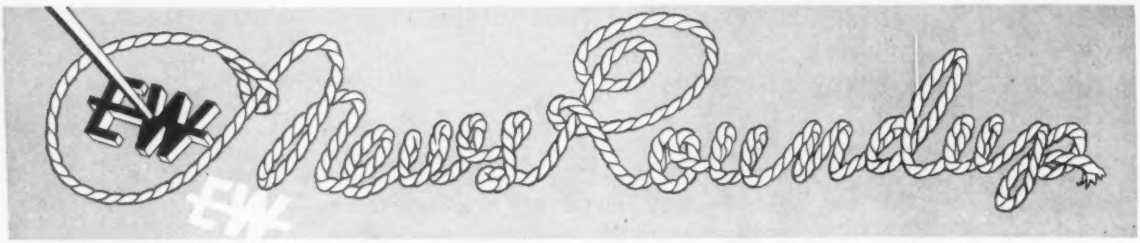


SIGNIFICANT ITEMS FROM THE EDITORS' NOTEBOOKS

POOL GROWS — The Northwest Power Pool will get a 1,000,000-kw addition by means of a new transmission line link which will bring power production facilities in Colorado, Wyoming and western Nebraska into the network. Pacific Power & Light is building a line from Billings, Mont., to Yellowtail, near the Wyoming border. There it will be connected to a new line of the U. S. Bureau of Reclamation between Yellowtail and Lovell, Wyo.

The pooling of the three-state intermountain area with the Northwest grid will permit taking advantage of area diversity in power capabilities and power demands. With the new connection, the Northwest Power Pool will have a generating capability of more than 8,500,000 kw. You will find more details in *This Month's News.*

—EW—

Watch for the new membership directory of the Pacific Coast Electrical Assn., which is scheduled to make its appearance soon.

—EW—

BOOM?—Despite Democratic assertions to the contrary, the country is in the midst of unprecedented good times. In fact, they are so good that some economists have worry wrinkles. Business might be so exuberant as to turn boom times into a speculative spree.

Industrial prices are on the way up, the cost of living is increasing and inflation again rears its ugly head. The Federal Reserve is clamping down on credit and raising the wages of capital higher in hopes of putting a damper on overoptimistic expansion plans. Although basically aimed at industry, the action has joggled the residential construction industry to the point that has definitely slowed down housing starts. It also has pushed utility bond interest into the 4½% region. Handling the economic brakes is a delicate task. The path between boom or bust apparently gets narrower and narrower as we climb higher.

If given a choice on a place to visit on Sept. 24, we would have picked Washington, D.C., to hear Kinsey Robinson answering cross-examination questions at the FPC hearings on the Mountain Sheep and Pleasant Valley project. We hope a report of the hearings is available by next press time.

—EW—

AWARD—General Electric's Lamp Division is going to begin presenting "The Nela Park Award" to six utility companies each year.

Winners will receive a plaque for the most successful, creative and imaginative bulb sales campaigns.

There are to be three groups of contestants with two categories each. The groups are: privately owned electric service companies with more than 100,000 customers; privately owned companies with fewer than 100,000 customers; and rural electric cooperatives and municipally operated electric service companies. In each group there is a category for companies that retail lamp bulbs, and another for companies that do no retailing but promote sales through dealers.

Judges are Fischer Black, publisher and editor of *Electrical World;* Paul B. Garrett, editor-in-chief of *Electric Light & Power,* and Burrous J. Martin, publisher of *Electrified Industry.*

—EW—

VICTORY—Vehicle drivers of Los Angeles Department of Water & Power were given a clever report on their safe driving progress. A bulletin board notice was headed up with "Veni, Vidi, Vici"—adapted from the classic quotation of Caesar.

Veni (you came) refers to the point on a graph where W&P drivers had about 11 accidents per 100,000 miles in 1943-44. Vidi (you saw) refers to the point in 1945-46 when the rate went even hgiher. Vivi (you conquered) refers to the 4.22 accidents per 100,000 miles the drivers have established in 1955-56.

WHY D-C?—All those who think that direct current passed away with the trolley car will be surprised to learn that it is playing an ever-increasingly important part in the scheme of things today. For example, General Electric market research people report that their company has produced more than 80,000,000 hp of d-c apparatus in the years between 1880 and 1955. However, two-thirds of that amount was produced in the past 15 years.

The requirements of automation, flexible production processes, highly refined control all contribute to the growing popularity of d-c drives in modern industry. The whole story is told in layman's language in a nonpromotional booklet published by G-E and entitled "Why D-C?"

—EW—

General Electric's Trumbull components department has had a name change. It is now called the circuit protective devices department.

—EW—

At the fall general meeting of the American Institute of Electrical Engineers, in Chicago, attention is being given to the use of digital computers by electric utilities. A total of five talks on the subject are scheduled. The talks will leave little doubt that the electronic wonders are breaking out of the accounting departments to aid with solutions to electrical engineering problems.

—EW—

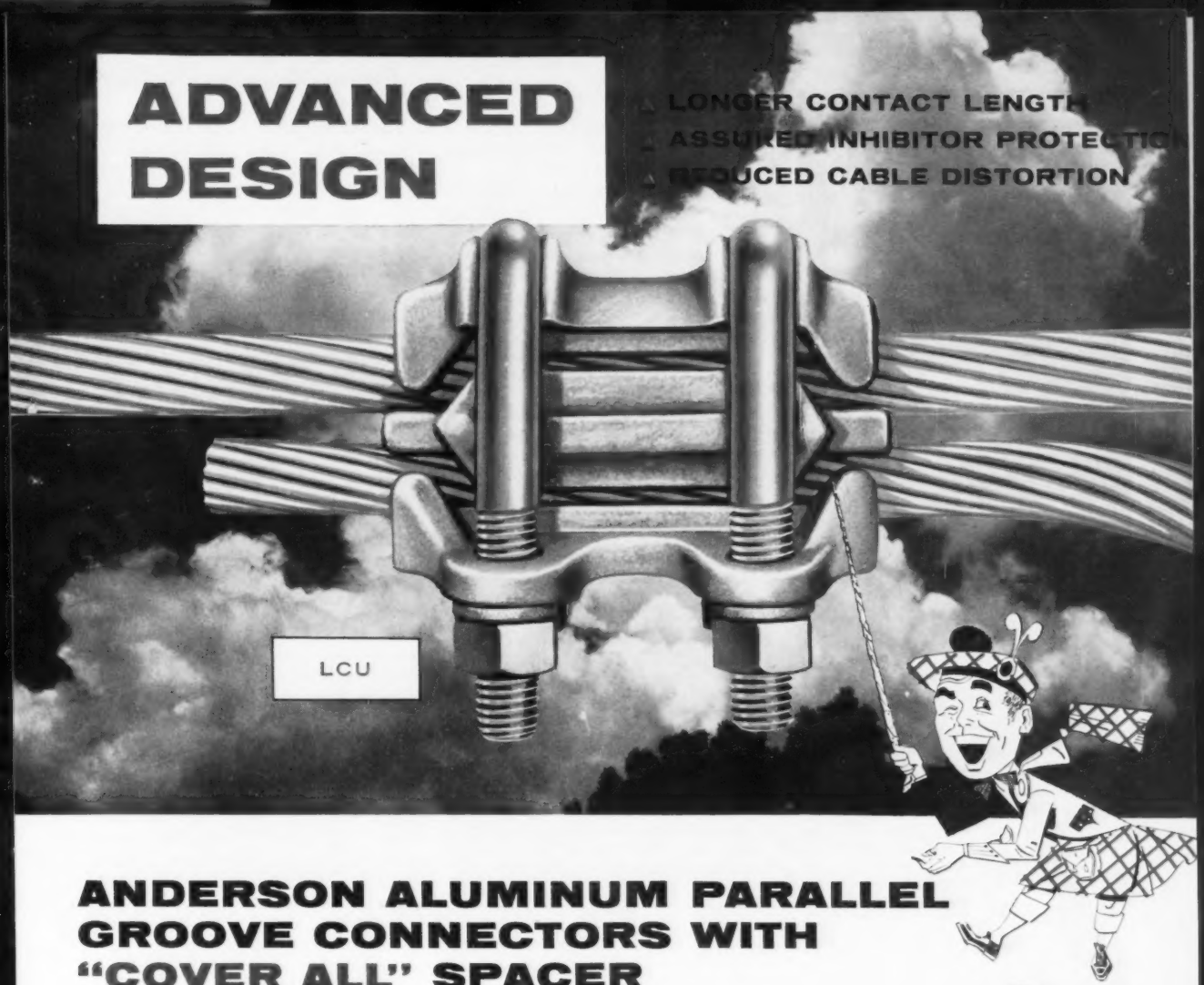
APPLICATIONS for hydroelectric development permits pertaining to California streams that are now awaiting Federal Power Commission action amount to about 4,000,000 hp generating capacity.

Largest project is Oroville Dam on the Feather River, which would have a capacity of 660,500 hp.

Pacific Gas and Electric Co. and

ADVANCED DESIGN

△ LONGER CONTACT LENGTH
△ ASSURED INHIBITOR PROTECTION
△ REDUCED CABLE DISTORTION

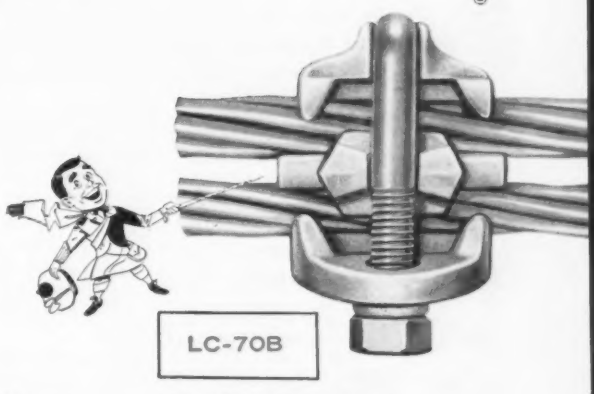


ANDERSON ALUMINUM PARALLEL GROOVE CONNECTORS WITH "COVER ALL" SPACER

The illustrations here tell a graphic story of Anderson's progress in aluminum . . . *a 30-year, pioneering span of bed-rock engineering* . . . to give the electrical power industry the products to *most efficiently* meet growing demands.

The new, advanced design of these U-bolt type parallel groove connectors accomplishes *ALL SIX OF THE SOUGHT-FOR MAJOR REQUIREMENTS!* (1) More efficient cable contact. (2) Increased pull-out strength. (3) Protection for inhibitor. (4) Maintains cable configuration by completely enclosing and protecting it. (5) Extended spacer helps to speed installation. (6) Greater range without sacrifice . . . due to advanced design of of spacer . . . reduces stocking.

Ask your ANDERSON Representative to give you the complete facts . . . test data . . . ratings . . . and cable ranges of these new connectors. Or, write to our home office.



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LEADER IN ITS CLASS

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Plus a complete, quality line of secondary service materials!

62 Years
Electrical Porcelain Since 1894.
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FINDLAY, OHIO

California-Oregon Power Co. are competing for permission to build dams on the Pit and McCloud Rivers.

Largest preliminary permit application is for the middle fork of the Feather River and its tributaries. Three applicants for this project are Robert P. Wilson of Taylorville, Pacific Gas and Electric Co. and the Richvale Irrigation District.

—EW—

NO CHOICE—Whomever you vote for this fall, you will have to vote for the preference clause. Both major parties included endorsement of that method of marketing federally produced power in their platforms.

While we're on the subject of voting, just prior to the election the Boy Scouts of America are planning to hang a tag on the door knob of every American home, said tag bearing the admonition to vote. It's a good idea. Just make sure your local Boy Scout Council is all set for action in your community.

—EW—

It's getting to be the time of the year when Ole Svensen tries to keep his company pickup away from headquarters. Ole doesn't like to have the transportation supervisor find his deer rifle in the tool compartment.

—EW—

POLICY—Fred A. Seaton, new Secretary of the Interior, was a speaker at the recent celebration and official completion of the Colorado-Big Thompson project in Colorado. His operational policy is probably contained in this paragraph from his talk:

"By carrying forward our important reclamation programs in keeping with the spirit and traditions we honor here today we can achieve great things . . . It is a gigantic task. It is a task to challenge the imagination and sorely tax our abilities to accomplish. Together—but only together—can we of the West meet and conquer it."

—EW—

WHOPPER—Philip Sporn, American Gas & Electric's pace-setting president, does it again. A 450,000-kw generating unit will be constructed by General Electric Co. for the Indiana & Michigan Electric Co., an AG&E subsidiary.

Billed as the world's most efficient power producer, the unit will be 73% larger than any now in operation. It will operate at 1,050 F and 3,500 psi in the supercritical pressure area.

ENDORSEMENT—The IBEW representing more than 650,000 union members has become a contributing sponsor to the 1957 observance of Electrical Week and has endorsed that program as an outstanding one for the industry.

Gordon Freeman, the international president of IBEW, said that the National Electrical Week program shows excellent promise of generating considerable nation-wide public impact for the benefit of all segments of the electrical industry. Sounds like interdependence is taking hold at long last.

—EW—

Here's another definition that may prove useful. Under Consideration: We're looking in the files for it.

—EW—

PURCHASE—The word should be out as you read this on whether members of the Shoshone River Power Assn. voted in favor of selling the co-op facilities to Pacific Power & Light Co.

Pacific's third and latest offer of $843,000 was made after a committee appointed by Shoshone's board of directors negotiated with the private utility.

The transaction is drawing strong opposition from the Wyoming State Rural Electrification Assn. Two-thirds of the members must approve the deal.

—EW—

An agency of the United Nations recently announced that the world population reached a maximum of 2,652,000,000 by the middle of 1954. Population growth between 1950 and 1954, however, was reported to be an astounding 35,000,000 people per year. Of this amount, the Asiatic countries, excluding the USSR, added 21,000,000 per year to their already overcrowded areas. Makes you begin to wonder if Malthus didn't have a point.

—EW—

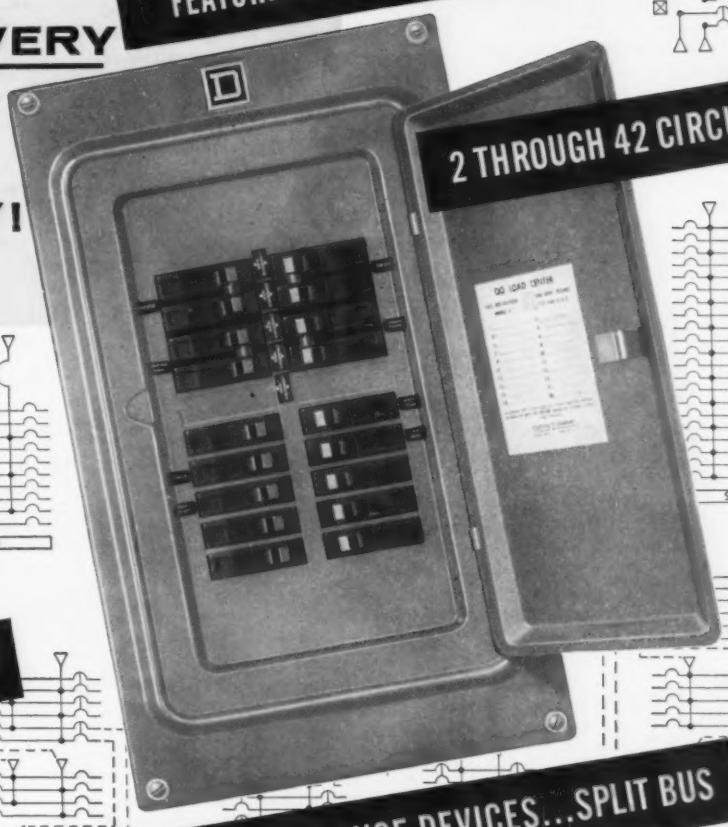
Yesterday is a canceled check.
Tomorrow is a promissory note.
Today is cash on hand—
spend it wisely.

—EW—

RATE HIKE—The Los Angeles Department of Water & Power has been given a 5.9% increase in rates by the city fathers. New rates, effective sometime after Nov. 1, will increase the

THERE'S A QO LOADCENTER TO FIT EVERY JOB... EXACTLY!

FEATURING QO—FINEST BREAKER EVER BUILT



2 THROUGH 42 CIRCUITS

MAIN LUGS

MAIN BREAKER

SERVICE ENTRANCE DEVICES...SPLIT BUS

- No "call-backs"
- Eliminates nuisance tripping
- Switches like a "T" rated switch
- Temperature corrected
- Indicates tripped circuit
- One size—15 through 50 amps
- Meets Federal Specifications WP-131A Class A
- Double poles UNLIMITED. No space penalty
- Silvered plug-in connections equal to best bolted construction
- Box lugs on all terminals, line, load and neutral
- Door is standard on 12 circuits and larger devices
- Flush, Surface or Raintight

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY

revenues by a total of $4,800,000 annually. The increase will shore up the borrowing power of the utility and enable it to meet more readily the financial requirements of expanding load demands.

—EW—

TALKING LIGHTS—A General Electric engineer has come up with a suggestion that radio units installed in traffic lights might keep folks from pushing the panic button during extreme emergencies.

Elmer W. Hassel's idea is to mount amplifiers in the same cabinets containing intersection radio tone control units. When trouble upsets the local citizenry, an operator can talk directly to motorists and pedestrians.

—EW—

More on the subject of G-E and lighting includes the 60th anniversary of the G-E and Graybar Electric Co. relationship as manufacturer and distributor of lamps.

—EW—

LOADBUSTER—It's seldom that a really brand new invention comes over the horizon for the industry. S&C has one, however, in the form of a device which fits over a disconnect switch and permits it to be pulled under load.

In essence it's a portable arc quenching chamber, light enough to be transported easily and used with hot line tools.

—EW—

CHUCKLE—"The Line," Line Material's colorful publication, carried this story in a recent issue.

A woman wrote this inquiry to the director of the home service department of a power company.

"I have a little dog of which I am very fond, but I've been having trouble teaching him not to chew the electric light cords. If he ever bites through a cord and any of the juice leaks out onto the floor, will I get a shock if I mop it up?"

—EW—

FOR PROGRAM CHAIRMEN—A visual explanation of the significance of the Hoover Commission Report on government efficiency is contained in a new half-hour film entitled "Waste Not—Want Not." It was prepared by the Columbia Broadcasting System for the Citizens Committee for the Hoover Report and is available on loan for the payment of shipping charges only. Viewers give it a high rating.

DEFENSE—Grant County PUD bought a new problem when the decision was made to use Allis-Chalmers turbines at Priest Rapids instead of English Electric Co. equipment on which the construction bid was made. With the U. S. units costing $500,000 more, a taxpayer brought suit against the substitution.

Defending the action, George Schuster, PUD commissioner, said:

"We are not, as has been claimed, trying to force any foreign manufacturer to withdraw from competition on the project. English Electric still is supplying some $13,500,000 of generators and transformers for Priest Rapids. However, English Electric had not had experience in building turbines of the size called for in the contract documents. The largest turbines previously built by them had a diameter of 189 in., while Priest Rapids turbines are to be 280 in."

The PUD has had requests from purchasers of Priest Rapids power to exercise its option to use the Allis-Chalmers turbines, according to Schuster.

—EW—

WELDING RATES—The California Public Utilities Commission, recognizing the unusual nature of the electric service required by welding equipment and the desirability of endeavoring to obtain a uniform rule for the rating and billing of welders has ordered new conditions for rate schedules for that class of service. Under its new order, charges for welder service will be more uniform in a particular utility service area and will not be dependent upon existing capacity of the utility serving facilities at that location or upon a judgment assignment of capacity.

In essence the new billing method requires, in all cases where connected load is a factor involved in rate calculations, that welder load be included as part of the connected load with no allowance for diversity between welders. However, on all schedules in which metered demand is a factor in rate calculations, it specifies that the diversified resistance welder load be calculated by multiplying the individual resistance welder ratings by the following factors and adding the results thus obtained:

1.0 times the rating of the largest welder;

0.8 times the rating of the next largest welder;

0.6 times the rating of the next largest welder;

0.4 times the rating of the next largest welder;

0.2 times the rating of all additional welders.

If the diversified resistance welder load computes out as greater than the

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850 Harrison Street
Telephone: Garfield 1-4971

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MACDONALD EQUIPMENT CO.
5300 Colorado Blvd.
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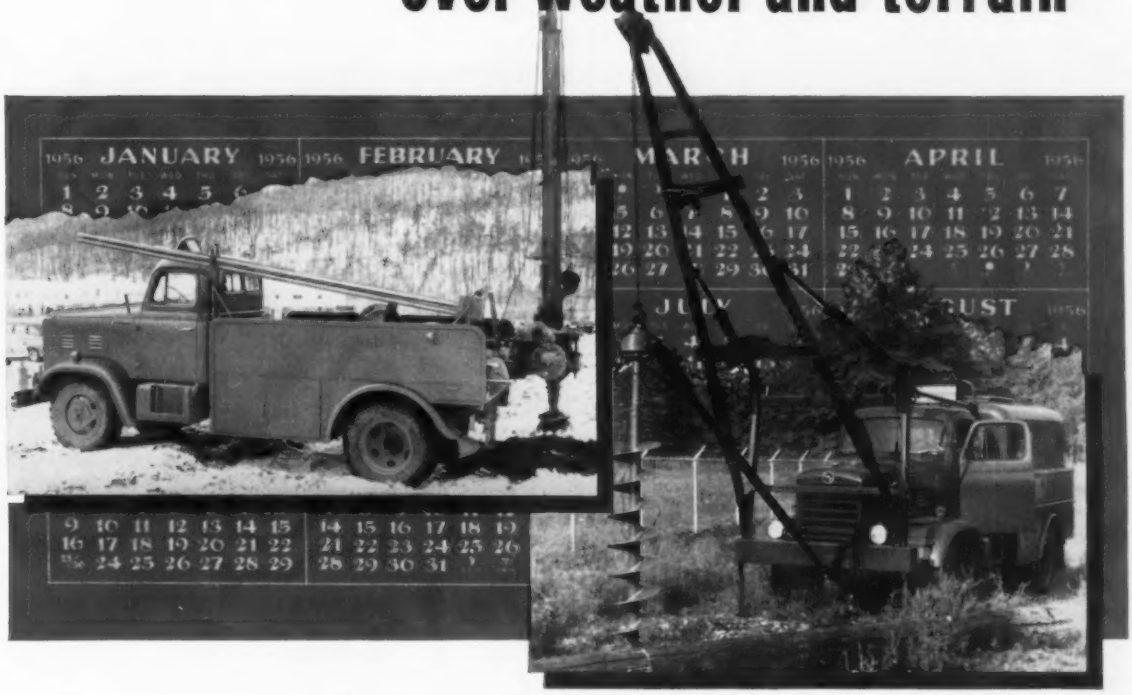
every day – or in emergencies...

YOUR ONLY CONTROL

over weather and terrain



There are no normal work conditions in line work. Sunshine or sleet, sand, mud or snow, hill or hollow . . . they're all in the day's work. The only control you have over weather or terrain is a Four Wheel Drive truck!

FWDs ask no questions. They just get there and do the job. The new FWDs are fast and flexible for scattered line maintenance jobs. They're rugged and dependable for tough line construction assignments.

You can choose the type of body that fits your requirements and the power and weight proportioning that's best for your terrain. There are front or rear-mounted derricks and diggers with power take-off designed for utility tools.

This is the truck that's as dependable as your service has to be. Efficient for the day-to-day jobs but with a priceless power reserve for emergencies. Find out how the versatile new FWDs fit your service requirements!

BUILDERS OF AMERICA'S FOREMOST HEAVY DUTY TRUCKS

FWD

FRAYER-MIAMIC DESIGN

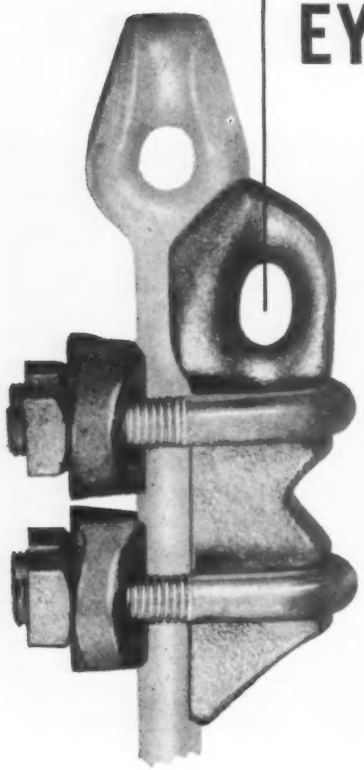
THE FOUR WHEEL DRIVE AUTO COMPANY • CLINTONVILLE, WISCONSIN • *Canadian Factory* • KITCHENER, ONTARIO

MIF

malleable iron

HIGH CORROSION RESISTANT

AUXILIARY EYE



Secured directly to a thimble or oval eye anchor rod it provides an additional eye for another guy, either permanent or temporary, or serves as a temporary attaching point for blocks or come along.

Where the strength of the existing anchor rod and capacity of anchor are adequate, using the MIF Auxiliary Eye eliminates costly digging and saves valuable time and material.

MIF Auxiliary Eyes come in various sizes to accommodate bolt and rod diameters of from ⅝" to 1".

For further information Write for Bulletin PH 3.

MALLEABLE IRON FITTINGS COMPANY

POLE HARDWARE DIVISION

Branford, Connecticut

MIF

Canadian Mfr. & Dist.: LINE & CABLE ACCESSORIES, Ltd. TORONTO

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill. • Lee-Smith Co., Miami, Fla. • B. H. McCoin, Knoxville, Tenn. • William J. O'Brien, Memphis, Tenn. • Robert P. Smith & Co., Jacksonville, Fla. • E. A. Thornwell, Inc., Atlanta, Ga. • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Krusi, San Francisco, Cal. • L. G. Wendegatz, Kansas City, Mo. • Williamson Sales Co., Shreveport and New Orleans, La.; Dallas, Houston, Tex.; Pine Bluff, Ark. • O. C. Witte Co., Detroit, Mich.

metered demand, the diversified resistance welder load may be used in lieu of the metered demand.

In view of the fact that some existing welder customers may have their bills considerably increased, such customers are to be given proper notice and allowed sufficient time to readjust their equipment or rearrange their circuits so that the increases may be avoided or held to a minimum level. For new welder load, or for those existing welder customers who change locations, these new rules will be applied shortly after the effective date of the order, but for the other existing customers a minmium notice of six months will be required before the new rules may be applied.

The utilities will be required to survey expeditiously existing welder load and have such surveys completed and notification given to existing customers by Aug. 30, 1957, with the new rules to be effective for such customers on and after March 1, 1958.

—EW—

More litigation in Washington challenges the legality of the State Power Commission Act passed by the state legislature last year. R. L. Keeting of Dungeness contends the act is unconstitutional because it is not clearly described in the title and makes no provision for hearings at which taxpayers and consumers can protest any proposed venture.

—EW—

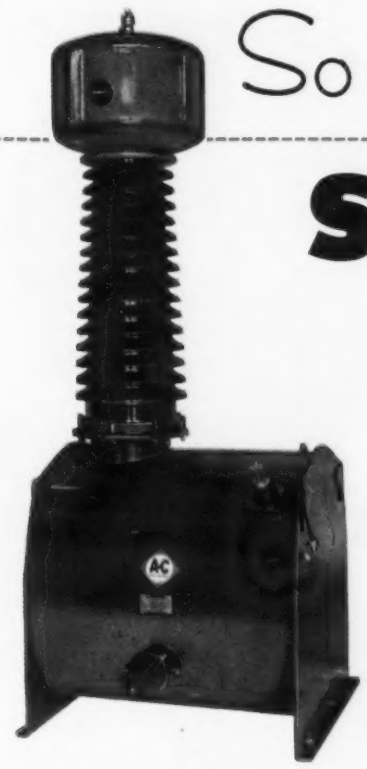
QUARTERSTRETCH—A final draft of the Klamath River Basin Interstate Compact, intended to "facilitate and promote" development of the river bordering Oregon and California, is slated for signatures this month.

State legislatures are to be asked at sessions convening in January to approve the document. It must also be adopted by Congress.

The compact has been four years in the making.

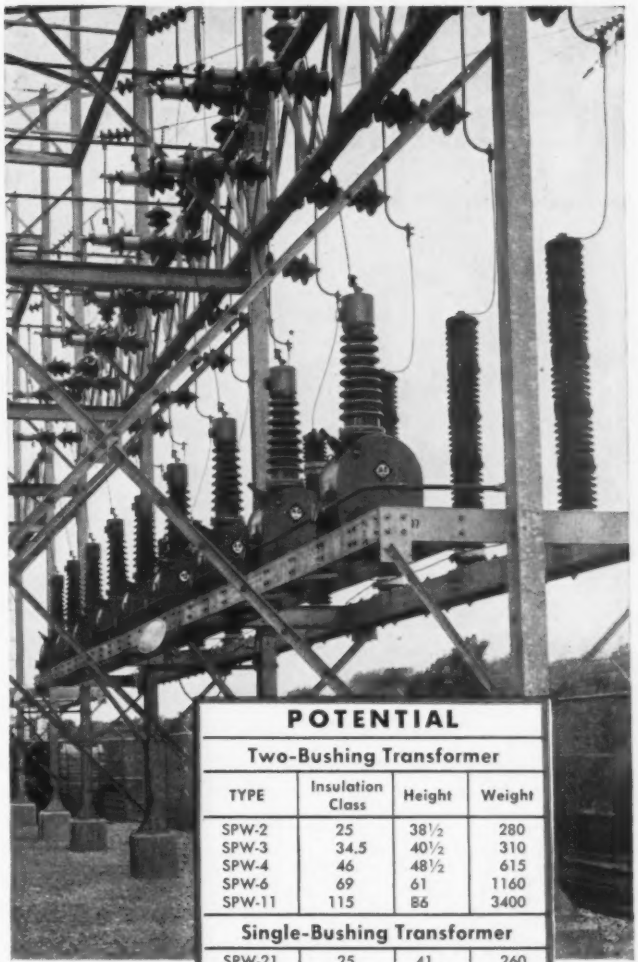
—EW—

Still on the subject of compacts, it is reported that federal agencies have approved all provisions of the revised draft of the Columbia Basin Compact. The revisions alter priorities for water consumption to protect large federal installations in downstream states while allowing adequate supplies for upstream states. Another change expands the term "major states," protecting Washington and Oregon.



So Light...SO COMPACT

So *Easy* to Install



MUCH smaller and lighter than previous designs, new Allis-Chalmers potential transformers cut installation costs and provide maximum handling convenience. Less space and less foundation to mounting structure are required. A fork truck or block and tackle is all that is needed to lift these 69-kv units into position. And, of course, relocating is accomplished just as easily.

Performance has also been improved in both ratio and phase angle with the advanced design of Allis-Chalmers potential transformers.

Many other design features — features that assure unparalleled dependability and long life — have been incorporated in these modern units. Get the complete story from your local A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

POTENTIAL

Two-Bushing Transformer

TYPE	Insulation Class	Height	Weight
SPW-2	25	38½	280
SPW-3	34.5	40½	310
SPW-4	46	48½	615
SPW-6	69	61	1160
SPW-11	115	86	3400

Single-Bushing Transformer

SPW-21	25	41	260
SPW-31	34.5	44¼	285
SPW-41	46	50¾	460
SPW-61	69	63¾	950
SPW-111	115	92	2310
SPW-131	138	112	3510

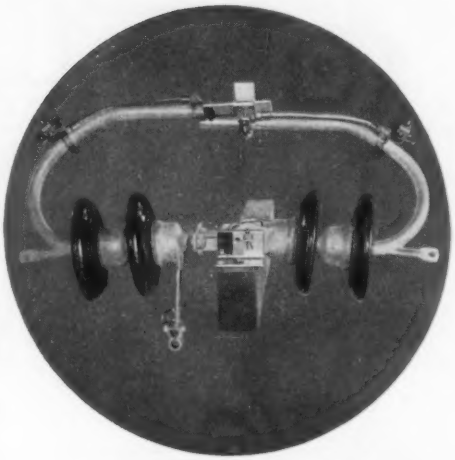
New Ratings have been added to the Allis-Chalmers line of potential transformers to include higher voltage insulation classes.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

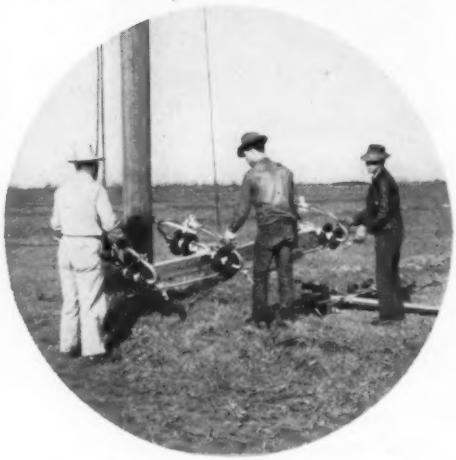
A-5164

You can install KPF switches more quickly, at less cost, than any comparable switch. Just bore six holes in a single cross arm, mount, and connect. No precision requirements, no temperamental mechanism to bind, freeze, malfunction or need lubrication. Just simple, cleanly designed parts, arranged in a rugged, foolproof manner for trouble-free operation. The economy and dependability of KPF switches has been proved on major utility systems for almost 50 years.



install in the air — or on the ground

Mount phase units individually to pre-installed cross arm on the pole top.



Assemble complete switch on the cross arm before arm is installed on pole.

Mount switch and cross arm on pole, then tilt pole into position.

Details in complete catalog. Why not order test installation?

KPF ELECTRIC COMPANY
Dept. W, 1624 E. Alpine Avenue
Stockton 5, California

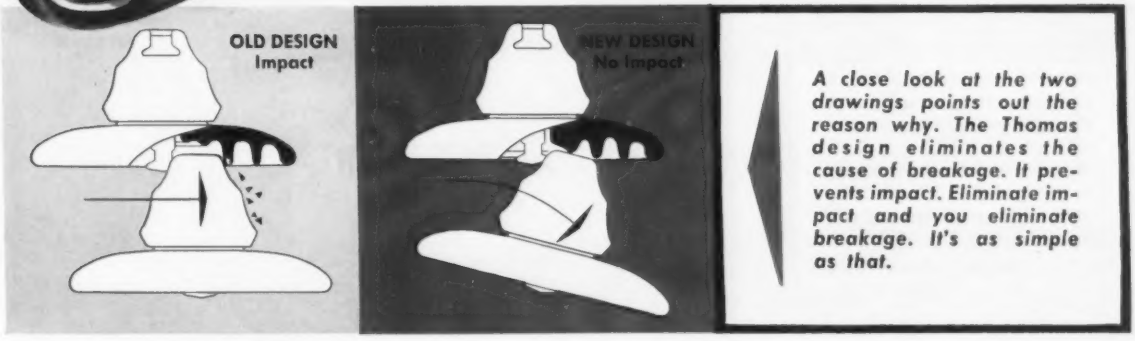
KPF
AIR BREAK SWITCHES
Standard for nearly half a century

TIME-TESTED AND FIELD-PROVED

Thomas

"CHIP-PROOF" INSULATORS*

- *eliminate impact*
- *eliminate breakage*



A close look at the two drawings points out the reason why. The Thomas design eliminates the cause of breakage. It prevents impact. Eliminate impact and you eliminate breakage. It's as simple as that.

In 1953, Thomas introduced the "Chip-Proof" insulator, designed to eliminate breakage caused by rough handling and assembling in the field. Today, utility service records have proved its worth in stopping breakage during assembly or disassembly of insulator strings. Here's why:

Thomas "Chip-Proof" design uses a "diverter skirt" — a heavy corrugation that can't break, designed with a contour that actually diverts the lower insulator or fitting away from the petticoats. No matter how roughly the insulators are handled, when the cap is pulled off the ball pin, it will first strike the diverter. This glancing blow deflects impact away from the lighter petticoats. Result: no chipping, no breaking . . . and a more rugged insulator.

Thomas "Chip-Proof" suspension insulators conform to the latest EEI-NEMA Standards (Classes 52-3 and 52-4) and are interchangeable with other units.

Throughout the country, wherever "Chip-Proof" insulators are now in use, their performance record speaks for itself. See your nearest representative today and ask for a demonstration.

Specify Thomas Insulators — The Best by Line Test.

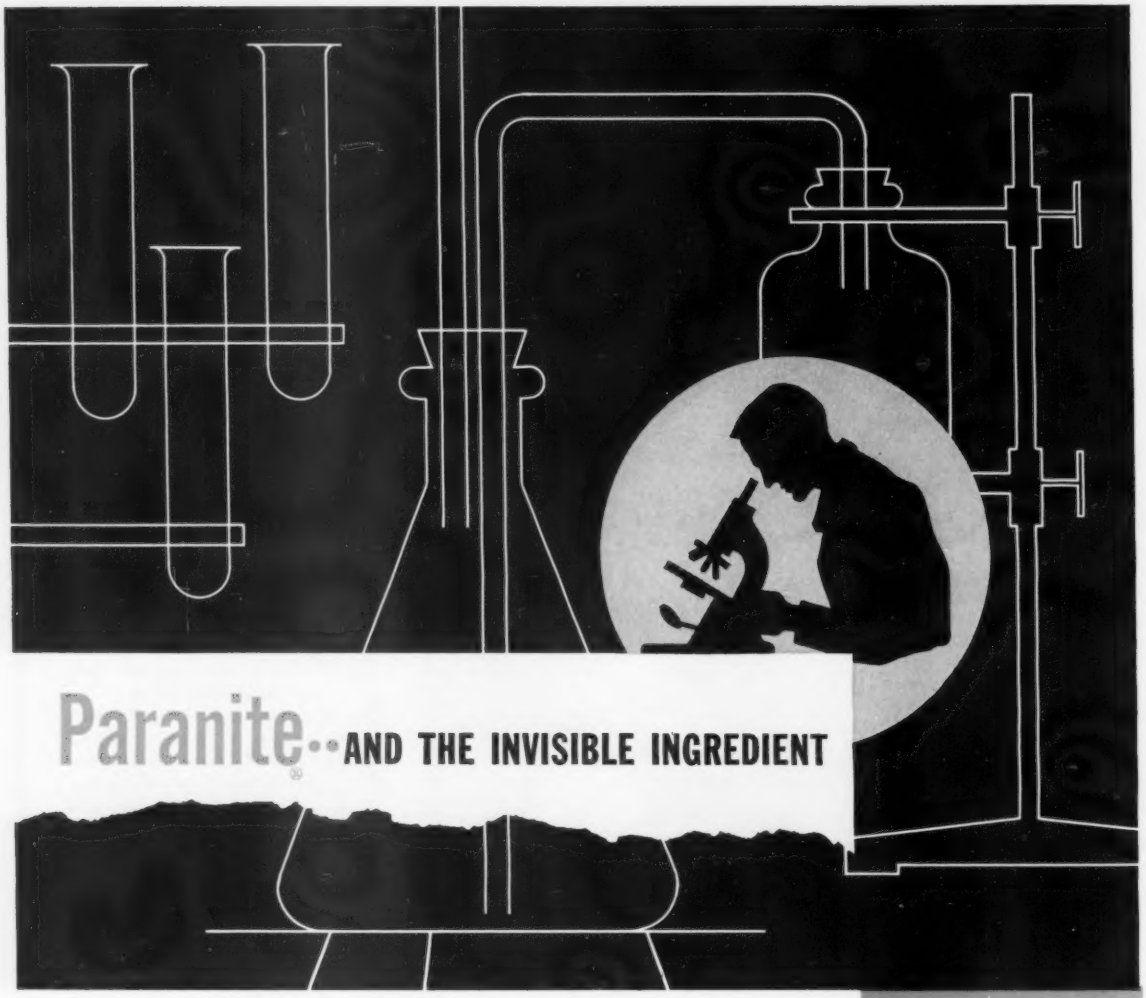
**Patent applied for*

Write for NEW Thomas EEI-NEMA Standards Bulletin

The R. Thomas and Sons Co.

LISBON, OHIO

1873 THOMAS INSULATORS our 83rd year RELIABILITY 1956



Paranite®—AND THE INVISIBLE INGREDIENT

● Electrical wholesalers and contractors coined a phrase decades ago expressing their confidence in Paranite products: "If It's Paranite, It's Right!" This reference by the trade became so common that in time the company adopted it as the Paranite slogan.

The privilege of enjoying such confidence didn't just happen. It was the direct result of the determination of everyone at Paranite to produce a better product each day than the day before, if humanly possible. This desire to achieve perfection has given Paranite products an "extra" that you cannot see ...or feel...and is truly an *invisible ingredient!*

SQC . . . Statistical Quality Control . . . for years has kept a constant, watchful eye on Paranite products. Scores of tests, graphs and measurements are made and analyzed daily by Paranite engineers seeking ways to give you superior products. This, too, is an important part of the *invisible ingredient.*

So specify Paranite . . . and be assured that every foot of wire and cable will be as nearly perfect as human hands can make it—utilizing modern equipment and cautious testing. This is the *invisible ingredient* working silently at Paranite . . . to your advantage! True today as in the past: "If It's Paranite, It's Right!"

PARANITE WIRE AND CABLE

DIVISION ESSEX WIRE CORPORATION

Factory: Anaheim, California

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***LOS ANGELES, 6415 East Fleet Street; *SAN FRANCISCO, 1077 Howard Street**
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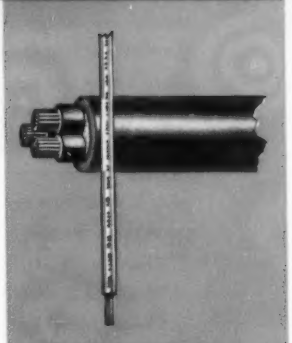


From POWER CABLE to FIXTURE WIRE . . .
you'll find Paranite quality high . . . service outstanding!

MEETING TOMORROW'S DISTRIBUTION NEEDS

Advanced system design overcomes geographical difficulties, helps Southern Colorado Power to . . .

KEEP AHEAD OF RISING RURAL LOAD

How does an electric utility serving thousands of square miles of irrigated farm land and rugged Rocky Mountain terrain, plus scattered urban centers, supply a steadily growing list of customers and prepare for future growth?

This challenge confronts the Southern Colorado Power Company, whose load has soared from 150 million kw-hr in 1950 to 270 million kw-hr in 1955.

Assistance in meeting the challenge was provided by comprehensive studies on the General Electric system analyzer. Result? Southern Colorado Power Company engineers are utilizing higher distribution voltages—13.2 kv—and, a 69-kv transmission loop is under construction around Pueblo to improve service continuity and increase capacity for the urban-rural area.

TURN PAGE FOR MORE DETAILS ▶

MORE POWER TO AMERICA

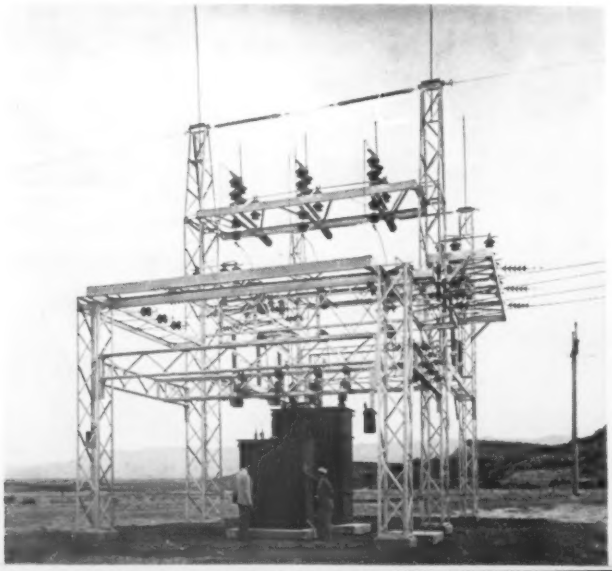
GENERAL ELECTRIC

MEETING TOMORROW'S DISTRIBUTION NEEDS

SYSTEM FLEXIBILITY is enhanced by Southern Colorado Power Company's West Station, a new General Electric substation. This huge installation ties 115-kv and 69-kv systems together. Examining the unit l. to r., Southern Colorado Power Company engineers, Howard E. Reader and George D. Perry, Jr., D. B. Hyer, Jr., Pres. of Southern Colorado Power Company and Vice Pres. W. C. Porter, Jr.

NEW STREET LIGHTING forms part of Pueblo's commercial load. These lights are General Electric Form 400 Luminaires equipped with 20,000 lumen mercury lamps.

NEW SUBSTATIONS help serve growing rural load. This modified General Electric compact rural package unit receives power at 69,000 v and serves a 7620/13,200Y-volt distribution system.



CAREFUL SYSTEM PLANNING helped Southern Colorado Power make optimum use of best possible design. L. to r., Southern Colorado Power Company's Horace H. Tureman, planning engineer; Vincent J. Isele, Jr., relay engineer; and Howard E. Reader, chief engineer, work out a design problem.

Southern Colorado Power plans system growth through higher voltages, new substation

General Electric apparatus aids system flexibility, continuity

In the face of adverse geography, Southern Colorado Power Company engineers have found that practical system design for flexibility, plus standard General Electric equipment for maximum reliability, are of prime importance.

In keeping with this, Southern Colorado Power Company is making greater use of 13.2 kv for distribution and now much of the system is efficiently served by this voltage. In addition, a huge new substation switching center with a 25,000-kva, 115/69-kv General Electric autotransformer will be employed to link Southern Colorado Power Company's 115-kv and 69-kv systems together for increased system-wide capacity. In Pueblo, a 120/208Y-volt underground network system has been implemented with two 500-kva network transformers as the first installation. Now, economical expansion can be accomplished with a minimum of engineering.

To activate their plans, Southern Colorado Power decided to utilize the best equipment available, therefore selected from General Electric's complete line.

When you, like the Southern Colorado Power Company, specify General Electric, you take advantage of the latest advances in apparatus design, construction and application. That's because General Electric engineers are able to translate the trends and needs of growing systems as reported by field personnel, incorporate newest materials and manufacturing techniques in producing them, and provide help in putting these advances to best possible use on your system.

And to help utilities keep service running smoothly, experienced General Electric service engineers plus a nationwide network of Service Shops stand ready to meet any and all maintenance and repair needs—day and night.

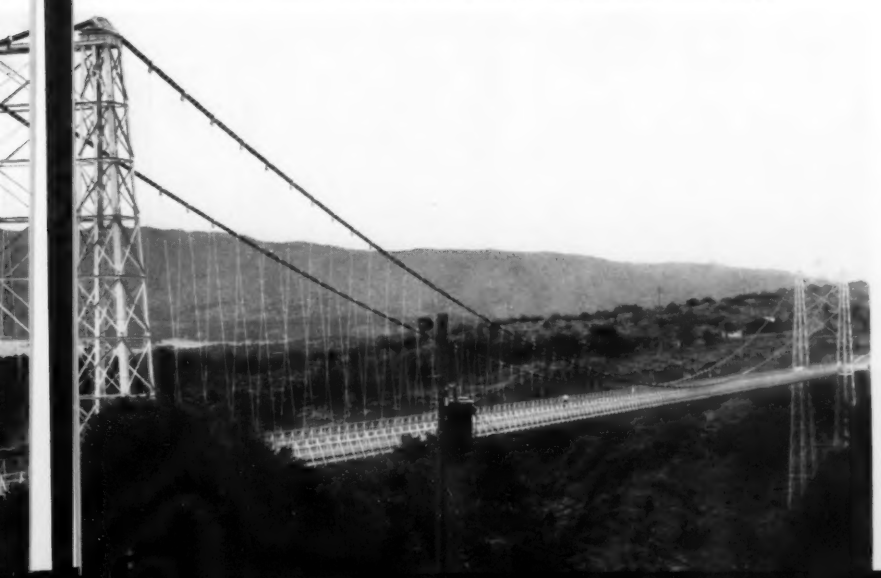
For full information on distribution equipment and distribution system services, contact your nearby General Electric Apparatus Sales Office, authorized Agent, or equipment distributor today. Or write General Electric Company, Section 303-3, Schenectady 5, N. Y.

TURN PAGE FOR MORE ON MEETING TOMORROW'S DISTRIBUTION NEEDS

MORE POWER TO AMERICA

GENERAL ELECTRIC

RELIABLE EQUIPMENT such as this 25-kva General Electric pole-type transformer at the Royal Gorge, shown in center foreground, minimizes maintenance in difficult terrain, helps cut costs. This installation furnishes power for restaurant and tourist facilities on site of the country's highest suspension bridge.



MOBILE METER LABORATORY facilitates installation and service of General Electric I-55 S meters in rural areas. Reliability of these meters proves to be a cost-saving factor. R. J. Ikelman, left, and Bennett Short, superintendent of Southern Colorado Power Company's Meter Service and Installation Shop accompany the truck on one of its field trips.

MEETING TOMORROW'S DISTRIBUTION NEEDS

7,500,000-VOLT DIRECT STROKES repeatedly applied to 37-kv Thyrite station-type arrester in the General Electric High-Voltage Laboratory at Pittsfield, Mass. Such research was a vital factor in the development of Thyrite* Magne-valve arresters.

How General Electric product development aids utility system planners

Research and product development at G.E. is a never-ending search for more efficient apparatus. For example, out of 10 years of research, came magne-valve arresters which give as much as 20% more protection and permit reduction of insulation levels by two steps on power transformers. The goal of this work is to provide utilities with new equipment to meet tomorrow's operating conditions most effectively.

G-E distribution system services include headquarters system planners—district application and product engineers—extensive product development facilities—equipment installation and field-service engineering. These services offer assurance of maximum operating continuity, on-the-spot application help, equipment efficiencies, valuable help in system design and techniques. Get the full story from your G-E Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y.

LIVE BETTER ELECTRICALLY

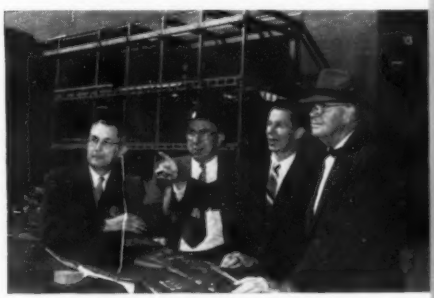
MORE POWER TO AMERICA

GENERAL ELECTRIC

More Reasons Why It Pays to See General Electric About Distribution Problems

EXCHANGE OF IDEAS among electric utility engineers is frequent at General Electric. Forums and discussions help resolve field problems, keep engineers abreast of latest developments.

ENGINEERING STUDIES AT G.E. include Power Systems Engineering, Electric Utility Systems Course, board studies. Above, utility company men visit a G-E factory as part of their course.



CO-OPERATIVE ENGINEERING is exemplified by G.E.'s application engineers who work closely with utility engineers on system design and equipment, help advance utility operation.

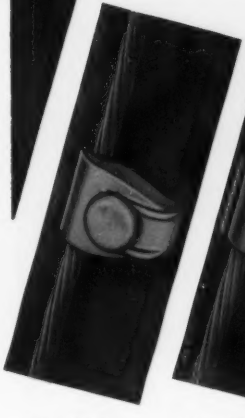
**Registered Trademark of the General Electric Co.*

YOU GET

LONG-LASTING PROTECTION FOR YOUR OVERHEAD SYSTEM

with

BLACKBURN *Grounding* DEVICES



Type GTC 1
One plate tower ground clamp

Type GTC 2
Two plate tower ground clamp

Copper Bonded Pigtail

Type GUV
U-bolt ground clamp parallel or 90°

Steel Driving Stud
for Sectional Ground Rods

Type GG
Ground Rod Clamp
Socket set screw

Copper Alloy Coupling for Sectional Ground Rods

Copper Bonded Sectional Ground Rods

Copper Bonded Regular Ground Rods

Type GGH
Ground Rod Clamp
Square head bolt

Type B
Budget Line Ground Rod Clamp
Square head bolt

Type GP 100
Electrolytic Copper Pole Bottom Plates
7½", 10", 14" dia.

Blackburn grounding devices will save you thousands of dollars annually in preventing burnouts of expensive overhead equipment. This complete line simplifies your stocking problem—one source for all your needs. Like all BLACKBURN products they are constructed of high-strength corrosion resistant materials—designed for easy installation and engineered for long-lasting, trouble-free grounding. Always specify BLACKBURN.

Available Through Electrical Wholesalers Everywhere

DISTRIBUTED ON THE WEST COAST BY

KORTICK MFG. CO.

JASPER BLACKBURN CORPORATION

ST. LOUIS 6, MO.

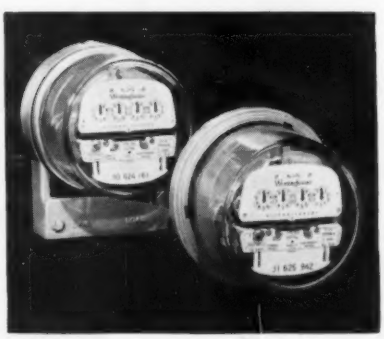
35 Madison Street — Phone MAin 1-2821

FACT: Corrosive atmosphere can't harm *Lifetime* meters

Corrosion can steal years of performance from your watthour meters . . . skyrocket maintenance costs. That's why Westinghouse gave its new Lifetime meters and sockets a corrosion-proof design which defies polluted atmosphere, salt vapor, heat, cold, dirt and moisture.

Aluminum, plastic, lacquer and enamel are used in conjunction with metal parts to help combat corrosion. All metal parts get protective treatments to keep them working smoothly, dependably.

For example, shafts and gears are gold finished. A chemical process is used to create a corrosion-resistant film on aluminum parts. This film actually becomes part of the metal, won't rub off or chip. Result: Westinghouse Lifetime meters run better, longer with less attention. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40482



New Lifetime watthour meters

Type DA bottom-connected, type DS socket construction.

YOU CAN BE SURE...IF IT'S
Westinghouse

GENERAL CABLE'S HIGH QUALITY CONTROL CABLE with

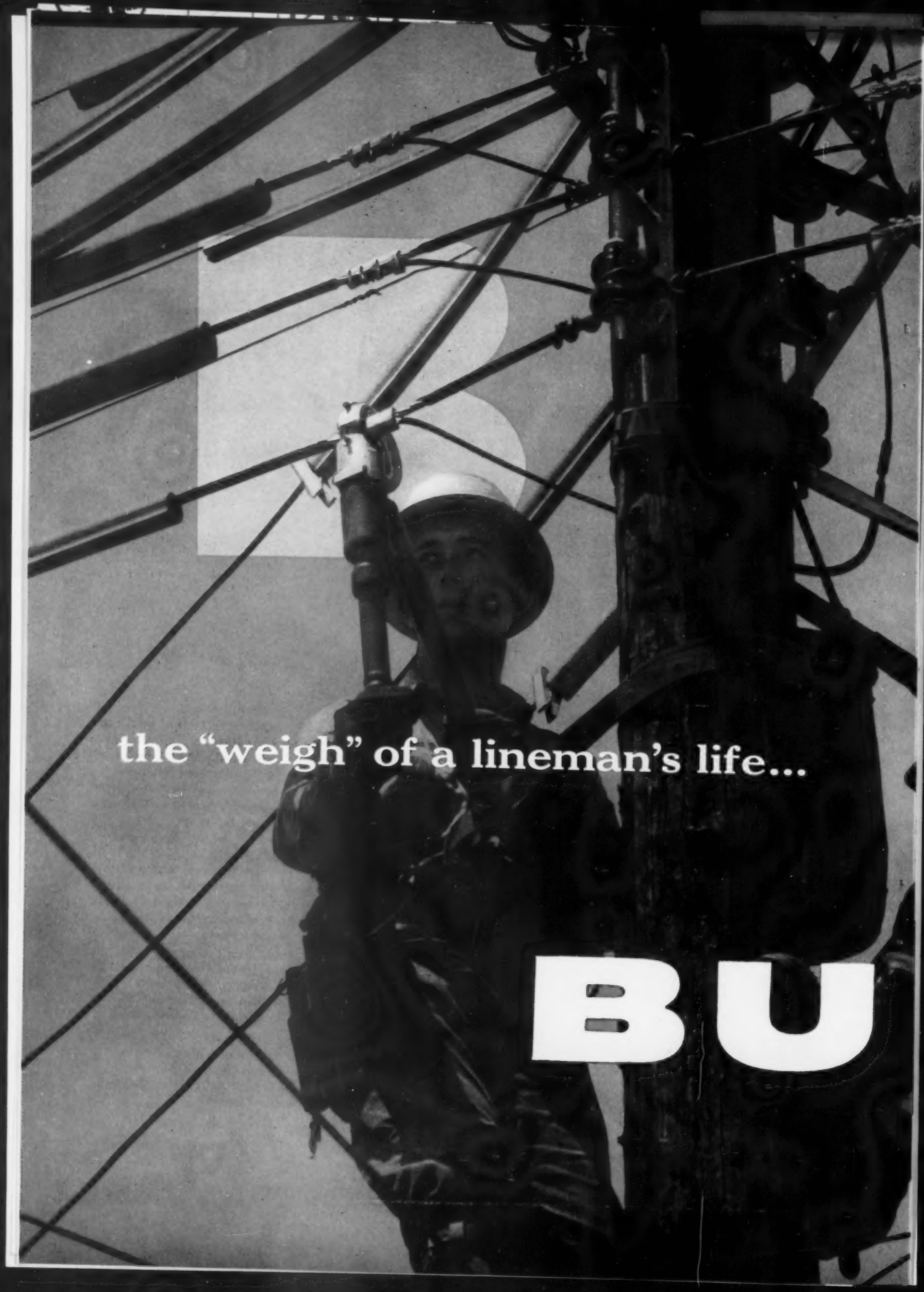
To preserve the superior physical characteristics inherent in black neoprene, General Cable applies a colored synthetic rubber base coating supplemented, where necessary, by spiral striping over the black neoprene jacket of individual conductors.

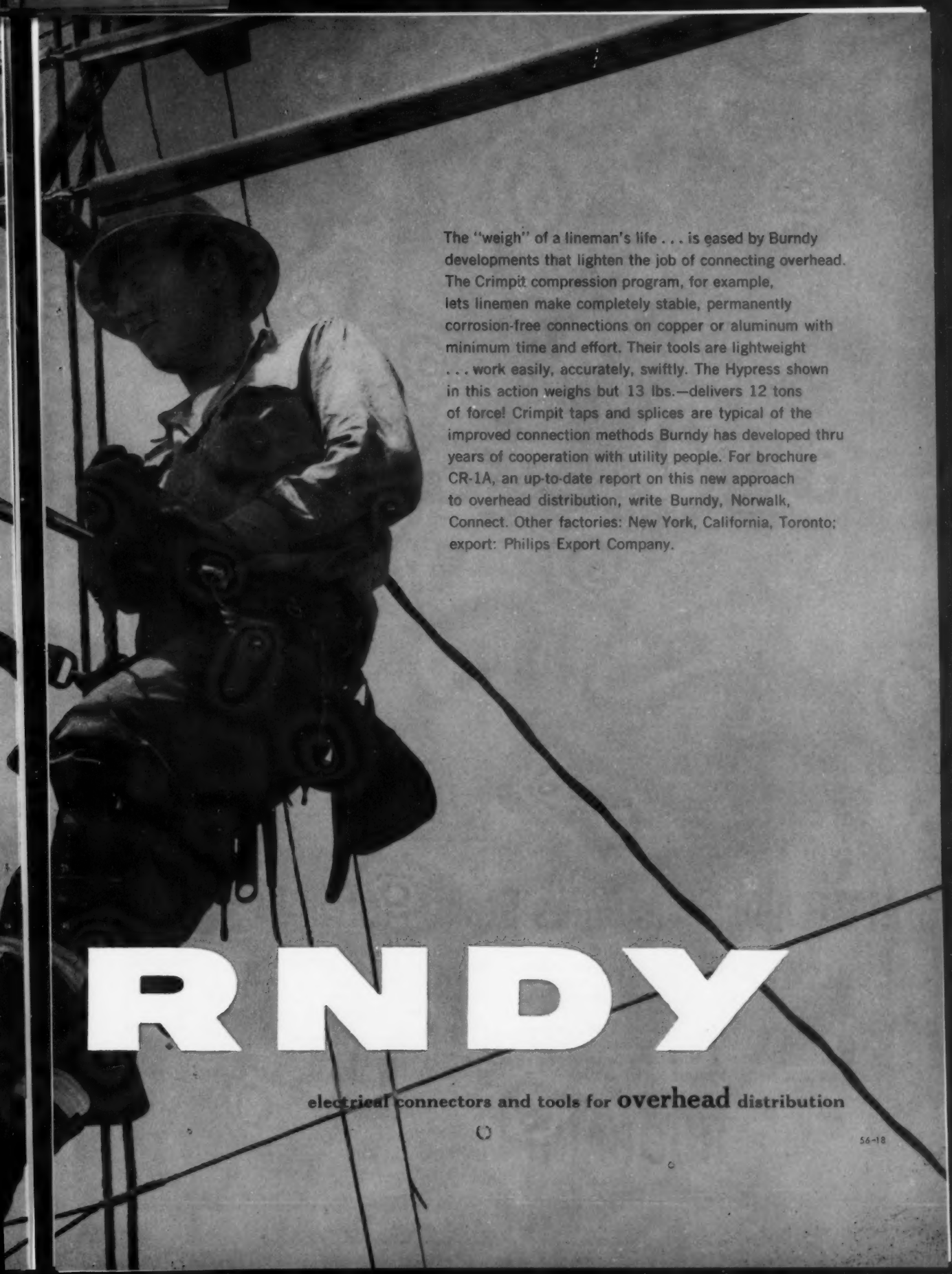
This new, carefully developed method of color coding the individual conductors of multiple conductor cable results in superior quality, brighter colors and an extra tough coating for permanence.

Station, Traffic, Elevator and Railway control cables are color coded in accordance with IPCEA Standard color sequence and to customer's specifications.

GENERAL CABLE CORPORATION,
420 Lexington Avenue,
New York 17, N. Y.
Offices and Distribution Centers Coast-to-Coast.

for quality and service . . . **specify GENERAL CABLE**


the "weigh" of a lineman's life...
BU

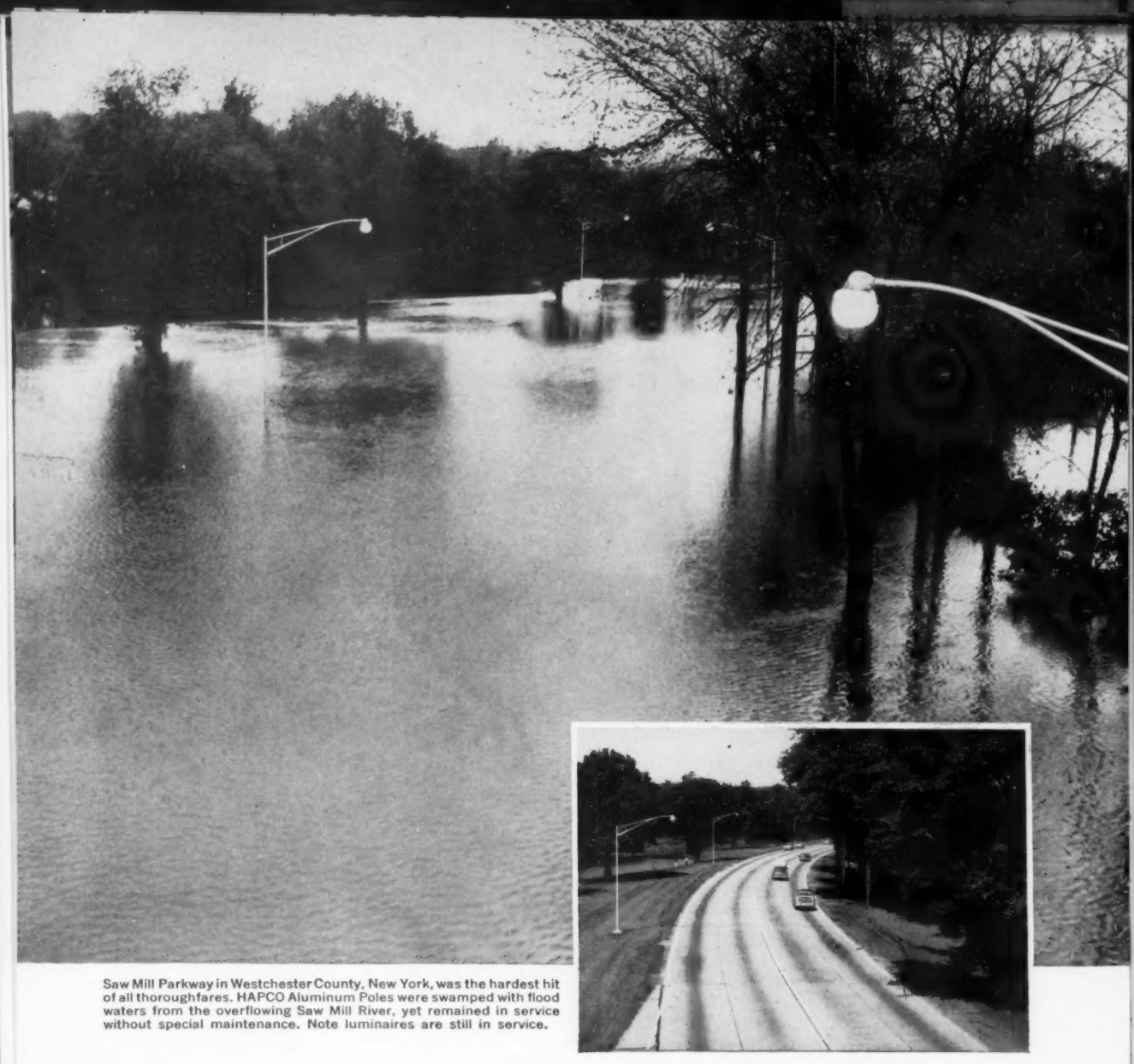


The "weigh" of a lineman's life . . . is eased by Burndy developments that lighten the job of connecting overhead. The Crimpit compression program, for example, lets linemen make completely stable, permanently corrosion-free connections on copper or aluminum with minimum time and effort. Their tools are lightweight . . . work easily, accurately, swiftly. The Hypress shown in this action weighs but 13 lbs.—delivers 12 tons of force! Crimpit taps and splices are typical of the improved connection methods Burndy has developed thru years of cooperation with utility people. For brochure CR-1A, an up-to-date report on this new approach to overhead distribution, write Burndy, Norwalk, Connect. Other factories: New York, California, Toronto; export: Philips Export Company.

RNDY

electrical connectors and tools for **overhead** distribution

56-18



Saw Mill Parkway in Westchester County, New York, was the hardest hit of all thoroughfares. HAPCO Aluminum Poles were swamped with flood waters from the overflowing Saw Mill River, yet remained in service without special maintenance. Note luminaires are still in service.

HAPCO Aluminum Poles Stand Firm in Heavy Flood

When the year's worst storm hit, dashing seven inches of rain in a three day period on the Yonkers, New York area, parkways were swamped, roadbeds demolished, bridges washed out.

Lighting losses were kept to a minimum because highway planners specified HAPCO Aluminum standards and brackets. HAPCO Aluminum lighting equipment retains its original strength and beauty under the most adverse weather and atmospheric conditions. It requires no initial or maintenance painting, offers the highest resistance to rust and corrosion.

Since HAPCO poles are lightweight, they install faster, easier, you begin saving money as soon as you buy. There is a HAPCO pole designed for every outdoor lighting application. Complete information is presented in Catalog HAL-754. Write for your copy today.

HUBBARD

ALUMINUM PRODUCTS COMPANY
Division of Hubbard and Company
Pittsburgh 1, Pa.

WHEN SPACE IS PARAMOUNT

New Switch Design For Moloney Network Transformers Saves Installation Space

You gain 5 inches of valuable vault space because Moloney's new high voltage switch is now 5 inches narrower than formerly. This results in an overall reduction in the length of network transformers, and permits more work space in old vaults . . . or reduces excavation costs on new vaults.

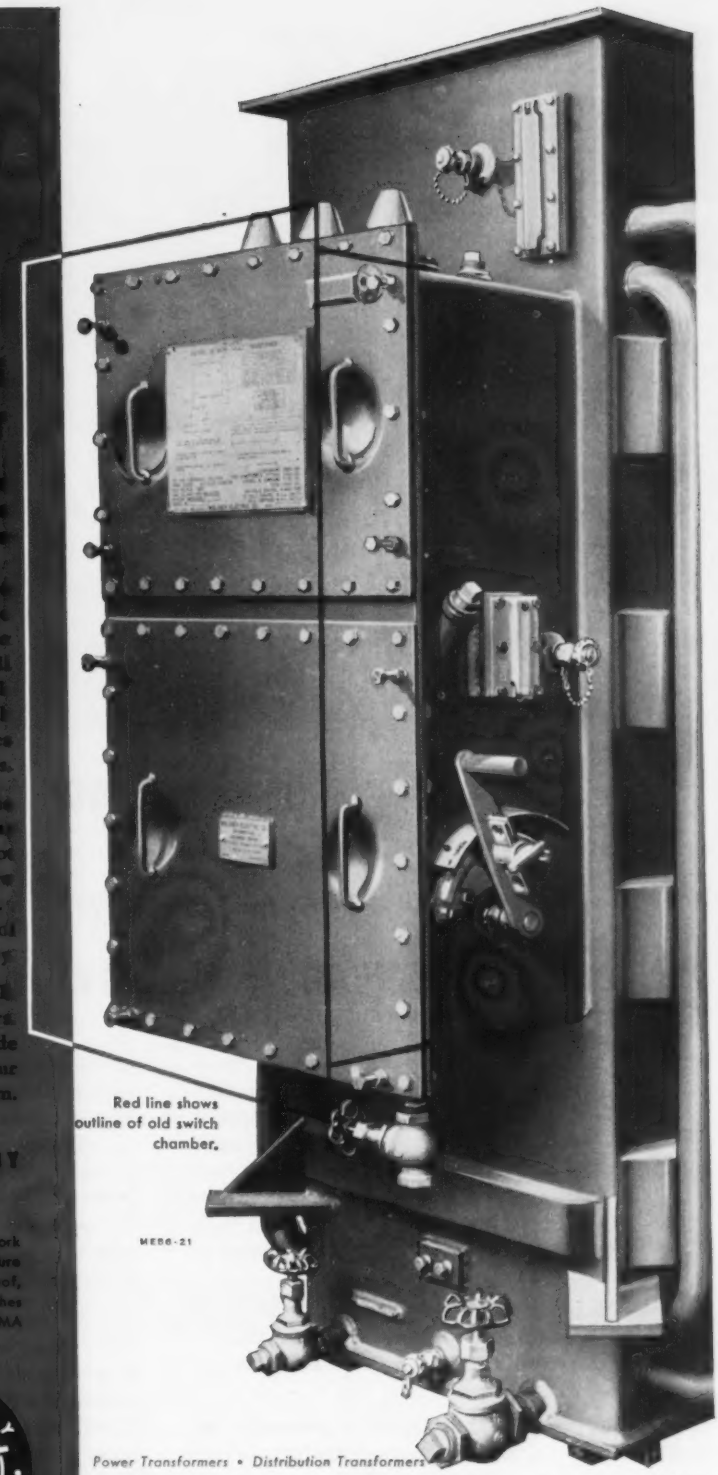
Moloney's new switch has the same liberal current carrying capacity as formerly. Electrical clearances have not been altered. In every way, Moloney's new switch meets NEMA standards fully . . . PLUS Moloney's own high standards of performance dependability.

Save time. Save money. SAVE SPACE. Specify Moloney Network Transformers. They're engineered to provide dependable, continuous service for your network system.

MOLONEY ELECTRIC COMPANY

All Moloney Network Transformers feature positive, fool-proof, high voltage switches that conform to NEMA standards.

MOLONEY ELECTRIC



Red line shows outline of old switch chamber.

MEB6-21

Power Transformers • Distribution Transformers • Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers • Subway Transformers • Industrial Dry Type Transformers • Capacitors • Transformers and Inductors for Electronics

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CAN.

Keeping track of

$5Al_2O_3.2MgO.24SiO_2.6H_2O.Na_2O.CaO$

...in Insulator Raw Materials

The complex formula above stands for "Montmorillonite", one of a group of highly plastic minerals present in the clay which is a component of every insulator. As these little known minerals contribute properties to the clay which are most important when it is formed into insulators for your power system, it is necessary to determine their presence and quantity in raw materials coming to us from the mines.

In the past, it has been difficult to make fast, positive identification of these fine clay fractions . . . even by such means as the petrographic microscope and X-ray diffraction.

Today, however, General Electric is pioneering the application of Differential Thermal Analysis (DTA) in this small but important phase of Locke* insulator manufacture. DTA is a reliable system for determining minerals in ceramic materials by interpreting differences in heat absorption and emission during firing between a test sample and a known inert material. These are recorded by the graph you can see in the photo. With DTA, another scientific method is added to mass production of fine electrical porcelain.

DTA is another illustration of the extremes to which we go to make sure you get Locke insulators of uniform density, high mechanical strength, dimensional accuracy and long service life. Insulator Department, General Electric Company, Baltimore, Maryland.

*Registered Trademark of General Electric Company.

Progress Is Our Most Important Product

GENERAL ELECTRIC

"Magic Touch"

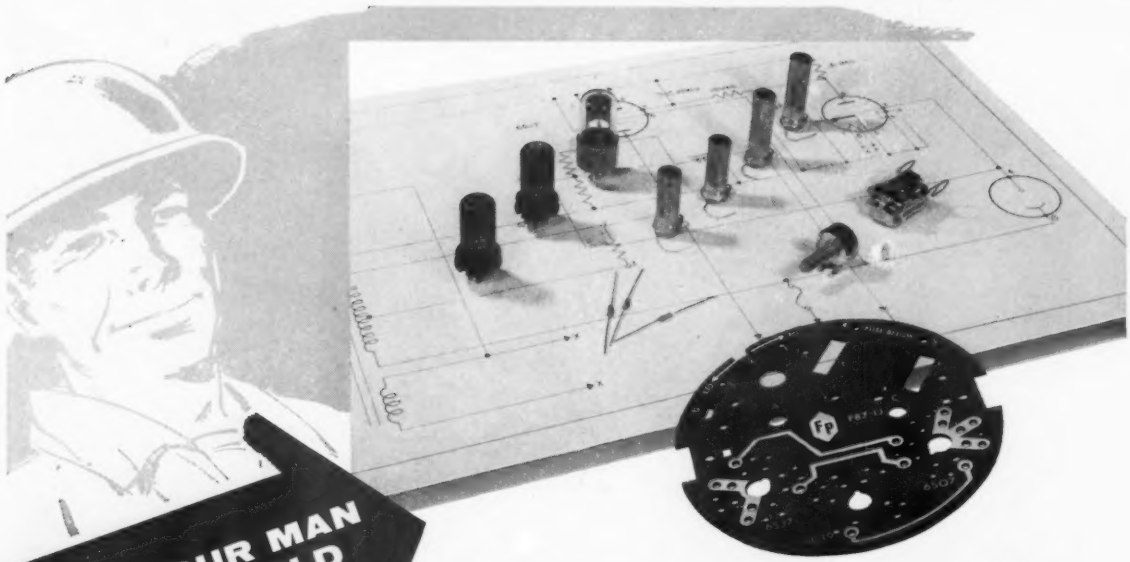
Lights burn and wheels turn when the magic of electricity surges through industry's life line of high voltage cable. Long, intensive testing has proved beyond question that Simplex ANHYDREX XX insulated cable possesses the stability and resistance that assure long, trouble-free service in all environments. Its amazing resistance to ozone and other oxidizing agents make Simplex ANHYDREX XX the logical choice for your high voltage applications. For complete technical data write for Booklet 1023.

SIMPLEX WIRE & CABLE CO.,
79 Sidney Street, Cambridge 39, Mass.

LIVE BETTER ELECTRICALLY

Simplex

ANHYDREX XX



ASK YOUR MAN IN THE FIELD ABOUT THE

component quality

OF FISHER-PIERCE PHOTOELECTRIC LIGHTING CONTROLS

A look inside any Fisher-Pierce photoelectric lighting control immediately reveals a primary reason why they require extremely low maintenance and provide long-run economy: *component quality*. Here are specific examples: two *pre-aged* amplifier tubes, instead of one dual triode, for a guaranteed minimum life of 20,000 hours; *wire wound* potentiometer; *Sigma* sensitive relay for low plate current drain of power tube; *linen-based bakelite* sub-mounting chassis and etched circuitry; *metal encased* paper capacitors (no electrolytics); blue-sensitive 1P39 phototube with non-hygroscopic base. No other photoelectric control provides such consistently high component quality. Combined with this are these four other important features:

DESIGN ADVANTAGES — Can be installed, serviced or removed safely and easily • Wide mounting versatility and orientation after bracket installation.

PROTECTION — From surges and lightning, by linen-based bakelite sub-mounting chassis and proper component spacing Circuit and load fuses, and lightning arrestor • Fail-safe operation.

ADAPTABILITY — Three basic series and numerous models for all mounting requirements, operating voltages, load capacities and desired contact arrangements.

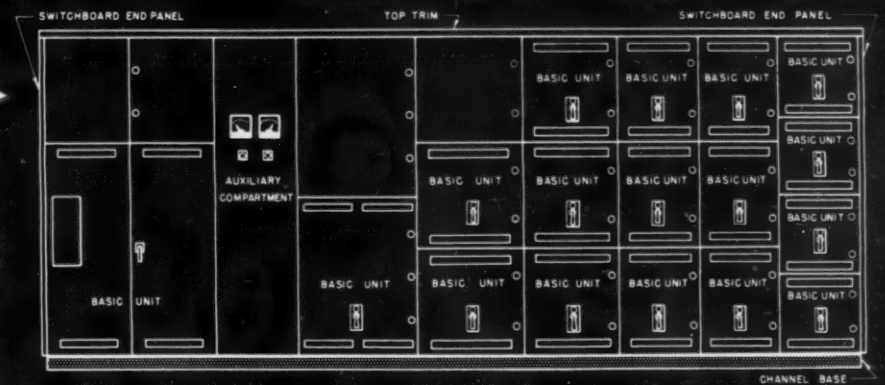
DEPENDABILITY — Proven by the thousands of F-P controls used by hundreds of utilities, over the past ten years.

Complete specifications and operating data are contained in informative F-P Bulletins, available on request. Or call the Fisher-Pierce sales representative in your area, for point-by-point proof of F-P superiority.

THE FISHER-PIERCE CO., INC.

43 Pearl Street, So. Braintree, Boston 85, Mass.

I-T-E Low Voltage Switchgear

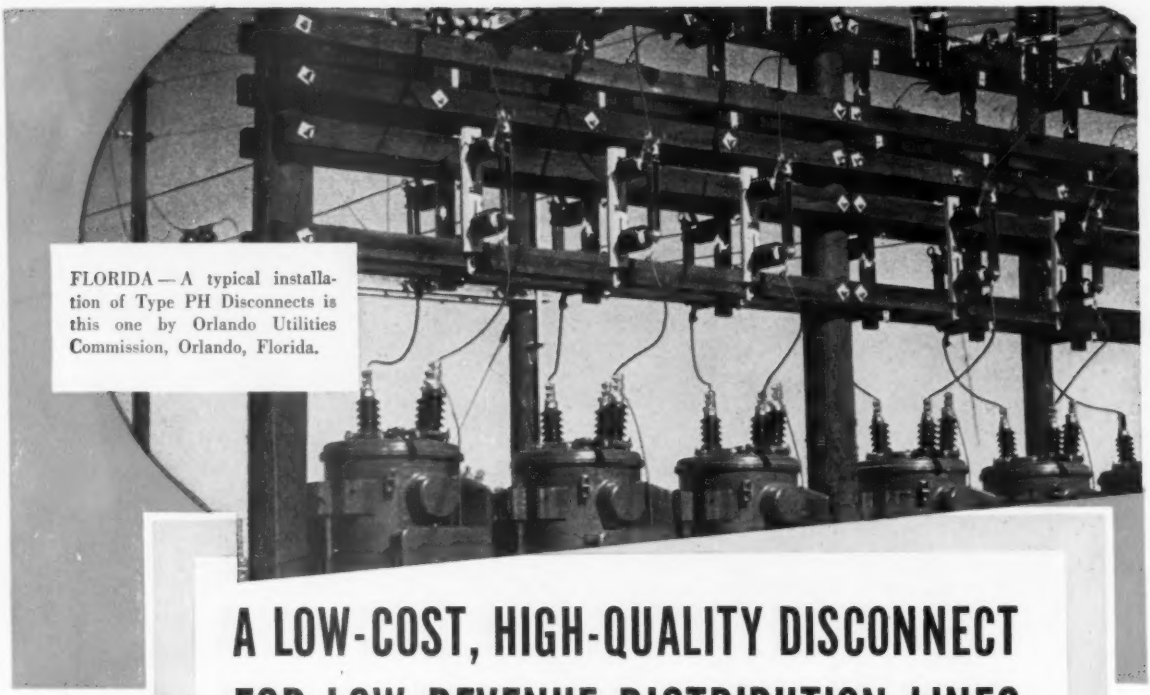


--the finest of modern switchgear factory assembled, shipped as a unit, ready to install in your plant

I-T-E Low Voltage Switchgear provides the optimum in dependability, safety, reduced maintenance costs, and attractive appearance. I-T-E Circuit Breakers have proved their worth in thousands of applications. I-T-E Structures are designed specifically to house and interconnect these time-proved protective devices and auxiliary equipment. When you combine the two, you have the finest of circuit breakers in the finest of structures. And you get the additional advantages of less special engineering, faster delivery, and units custom-made in standard frames to fit your requirements.

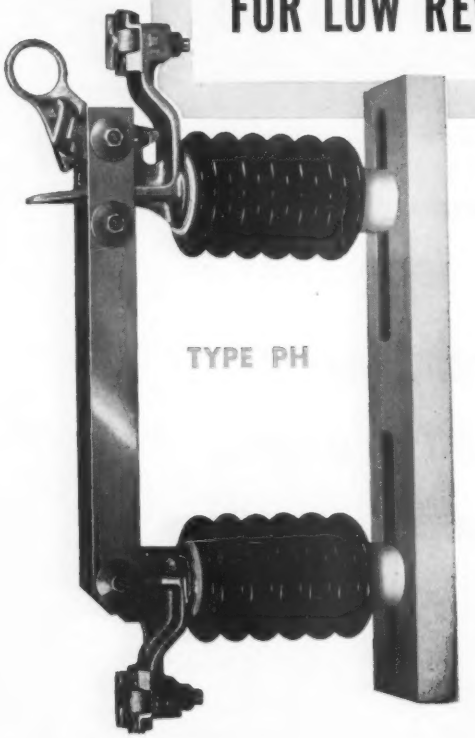
For complete information, consult your nearest I-T-E sales office. Or write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division



FLORIDA — A typical installation of Type PH Disconnects is this one by Orlando Utilities Commission, Orlando, Florida.

A LOW-COST, HIGH-QUALITY DISCONNECT FOR LOW REVENUE DISTRIBUTION LINES



SOUTHERN STATES TYPE PH HAS MANY DESIGN EXTRAS

It is often difficult to justify expensive switches for isolating, by-passing, or disconnecting on low revenue distribution lines. Yet the mechanical features of such disconnects are highly desirable, as any operating man knows.

That is why Southern States designed its popular, low-priced Type PH Disconnect. Its cost is easily justified, and yet it has many design extras found on more expensive switching equipment. For instance:

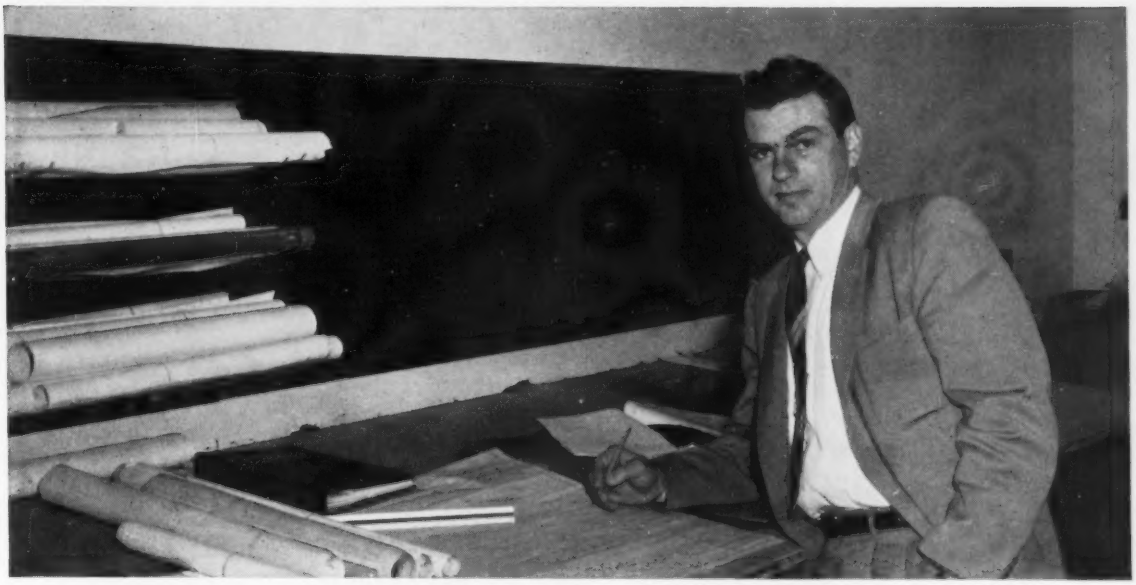
- **High-pressure line contacts**
- **Integral terminals**
- **Rugged parallel blade construction**
- **Blade pry-out action**
- **Positive blade latching**

This single throw, single pole, hookstick-operated switch designed for wood crossarm mounting, is answering the requirements for many utilities throughout the nation. You will find it profitable too. For full details, write for Bulletin 54 PH.

◀ **CHANNEL OR ROLLED FLANGE STEEL BASES ARE AVAILABLE.**

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

Lighting by DECIDEDLY BETTER DAY-BRITE Lighting Fixtures makes the big difference . . .



Mr. M. M. Oldman of M. M. Oldman Company, Los Angeles, California

"Day-Brite fixtures save us a lot of time"

"The A-J hanger is one of the best of the many good things we like about Day-Brite fixtures.

"These hangers save a lot of time on the job—particularly on hard-to-work-with and uneven ceilings. Easy adjustment lets us lay in our fixture runs and trim them up later. Adjustable features and different hanger lengths also make A-J hangers good on sloping ceilings.

"So far as our customers are concerned, they're impressed with Day-Brite fixture quality. Everyone knows about Day-Brite—it's a nationally advertised line and that gives us the added prestige that is often valuable in getting jobs where only the best is good enough."

From one end of the country to the other, contractors feel the same as Mr. Oldman. Like him, they know that every Day-Brite job is a real recommendation for the next one.

Day-Brite A-J hangers are now furnished in three lengths—8-inch, 12-inch and 24-inch. Swivel fitting and over an inch hand-operated vertical adjustment—no field assembly of screws, bolts or locknuts required.

61172

Certified Lighting for a Better America

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

DECIDEDLY BETTER DAY-BRITE Lighting Fixtures

Day-Brite Lighting, Inc.
5412 Bulwer Avenue
St. Louis 7, Missouri

Only Westinghouse offers you **the transformer**

with a PRE-TESTED LIFE!

Here's a transformer that can actually help you program your equipment investment thirty years from now—today. How? Through a revolutionary new concept of accelerated life testing, Westinghouse has pre-tested transformer life. Thirty years of equipment service has been telescoped into three.

Entire transformers from the production line have been put through literally thousands of cycles of overload up to 450% of rating, under closely simulated service conditions. Masses of data used to set up this unique program of testing include representative ambients as well as abnormal currents and voltages such as lightning and switching surges. Here is exhaustive evidence of durability of materials, uniform strength of windings, capability of whole insulation systems. Here is foolproof evidence of the soundness of Westinghouse transformer design . . . evidence that test-tube testing can't match.

The new Westinghouse Type S and CSP® transformer developments are based on the soundness of this design. Overload capability for all transformers has now been increased 20%, *without sacrifice in normal service life*. You get transformer capability tied more closely to modern load demands . . . a greater margin for peak. For the CSP transformer . . . fewer trip-outs, more time to make change-outs.

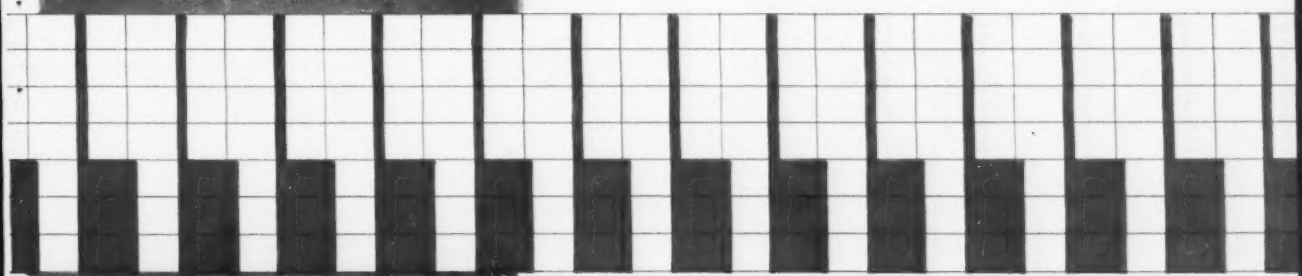
Are these transformers at these ratings proved on the line? 10,412 uprated Westinghouse transformers have operated successfully up to three years throughout the systems of utilities in New York, Missouri, Texas.

So here is double proof of performance of Westinghouse transformers. You don't have to gamble.

See your Westinghouse sales engineer, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-70782

WATCH WESTINGHOUSE!

COVER THE PRESIDENTIAL CAMPAIGN ON CBS TELEVISION AND RADIO!



"Time and temperature tests on insulation or wire by themselves just aren't the answer," says A. M. Lockie, design engineer, who has developed exclusive, new life testing of distribution transformers. Life-testing procedures at Westinghouse are based on experience obtained from subjecting transformers to 2200 overloads, 30 short circuits at 15 times rated current, a series of impulse, dielectric and induced potential tests, and daily load cycles up to 450% of rating.

Photo courtesy Public Service Electric and Gas Company of New Jersey

J-M Transite Ducts go in quickly, easily and permanently

Quick, low-cost installation is promoted by Transite Ducts. The light, 10-foot lengths are easily handled . . . and readily joined with either Transite Couplings or J-M Plastic Couplings. Many fittings are available to simplify even the most complicated installation. The permanently smooth interior surface of these asbestos-cement ducts prevents cable injury, makes long pulls possible and simplifies cable replacement.

Incombustible Transite Ducts confine arc damage, protecting adjacent cables from heat and flame. Inorganic, nonmetallic, Transite Ducts are corrosion-resistant, immune to rust and rot and unaffected by electrolysis. These ducts dissipate heat faster, reducing I^2R losses, enable cables to carry heavier loads and prolong insulation life.

Available in 2 types: Transite Conduit for exposed work and installation underground without concrete encasement; and Transite Korduct for installation in concrete.

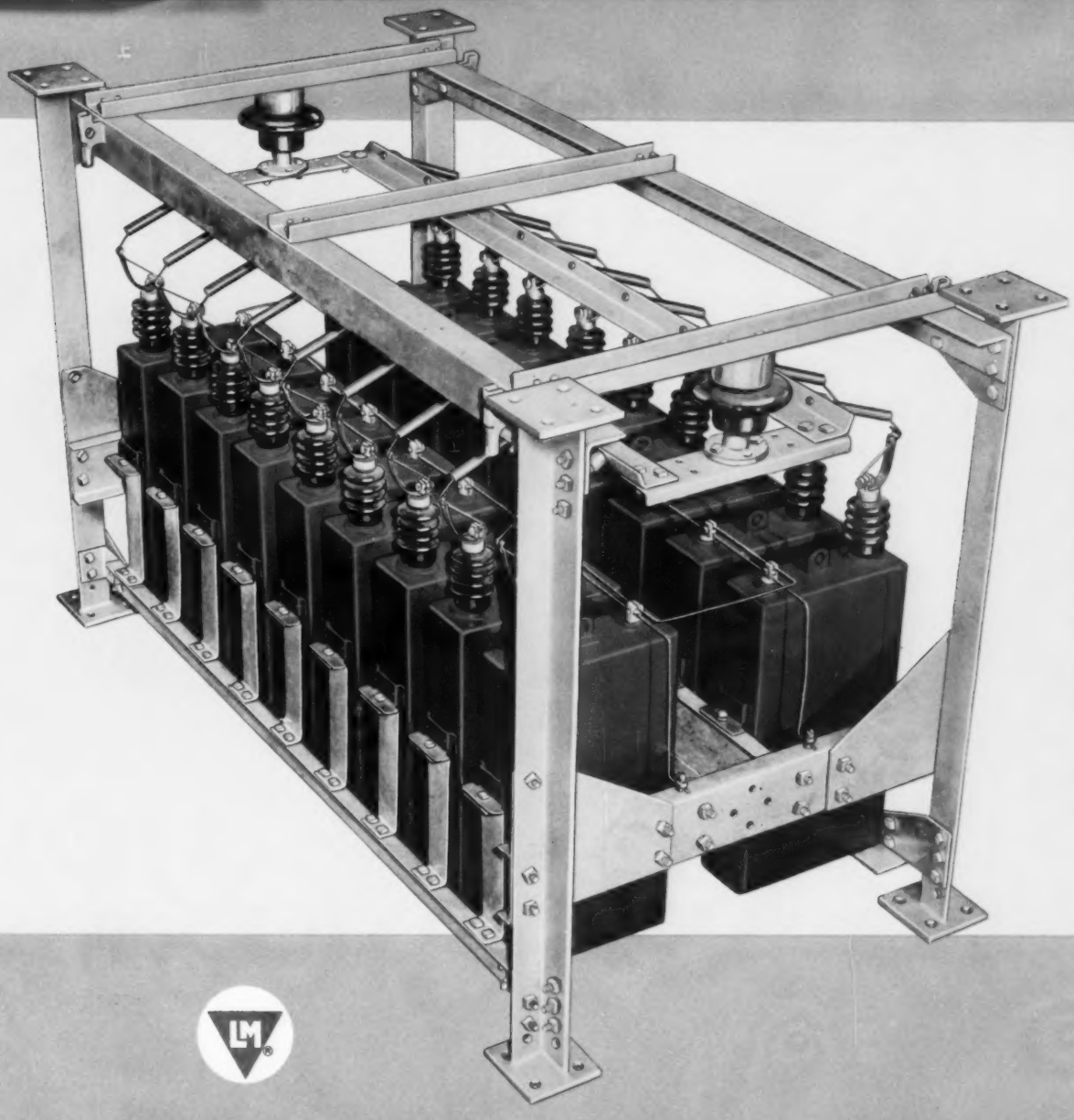
Let us send you more information about Transite Ducts.
Just write to Johns-Manville, Box 14, New York 16, N. Y.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE® DUCTS

TRANSITE KORDUCT®—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement



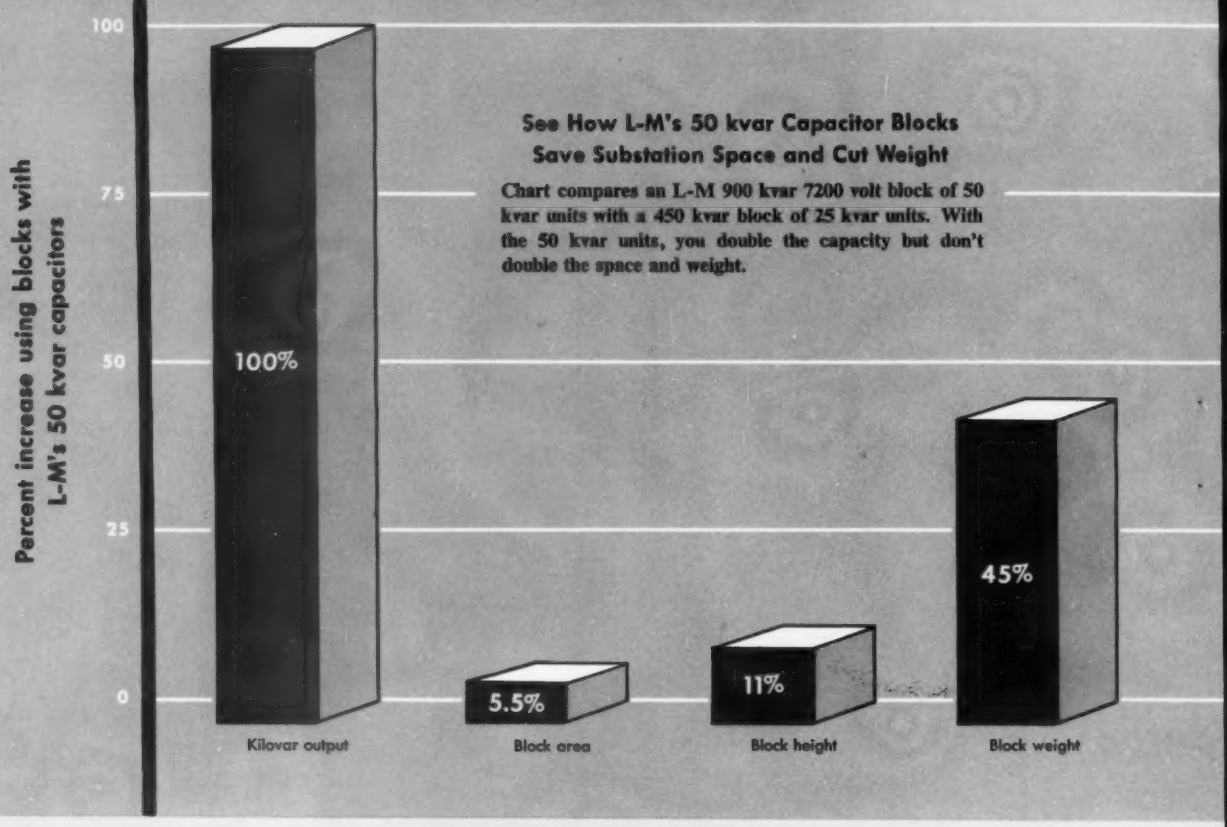
L-M's New 50 Kvar Capacitor Blocks

Save Space, Cut Costs

LINE MATERIAL
A McGRAW ELECTRIC COMPANY DIVISION

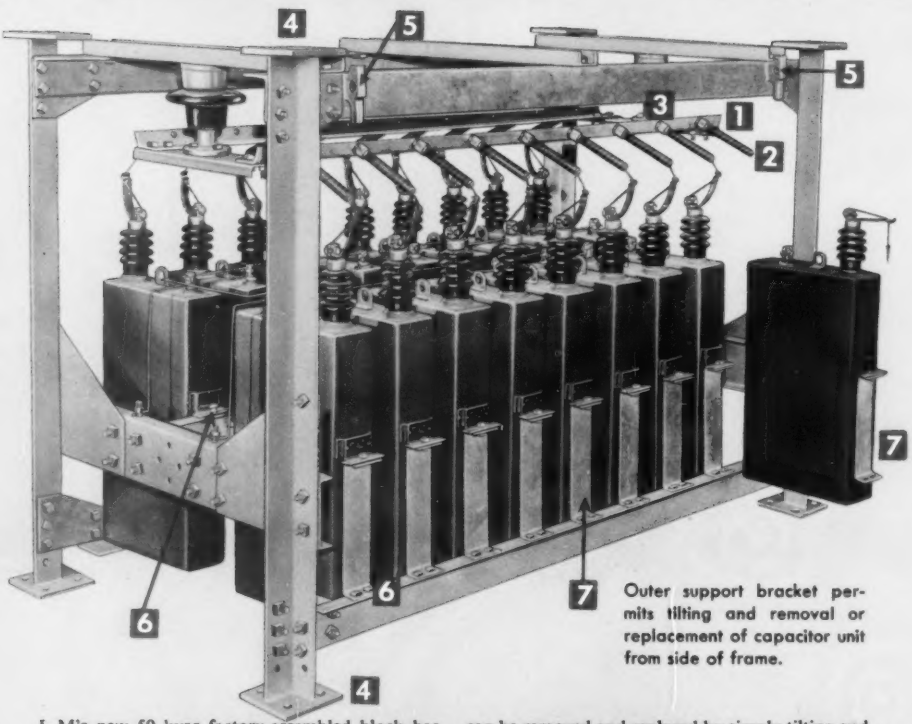
Elemex® Capacitors

see details ▶



See How L-M's 50 kvar Capacitor Blocks Save Substation Space and Cut Weight

Chart compares an L-M 900 kvar 7200 volt block of 50 kvar units with a 450 kvar block of 25 kvar units. With the 50 kvar units, you double the capacity but don't double the space and weight.



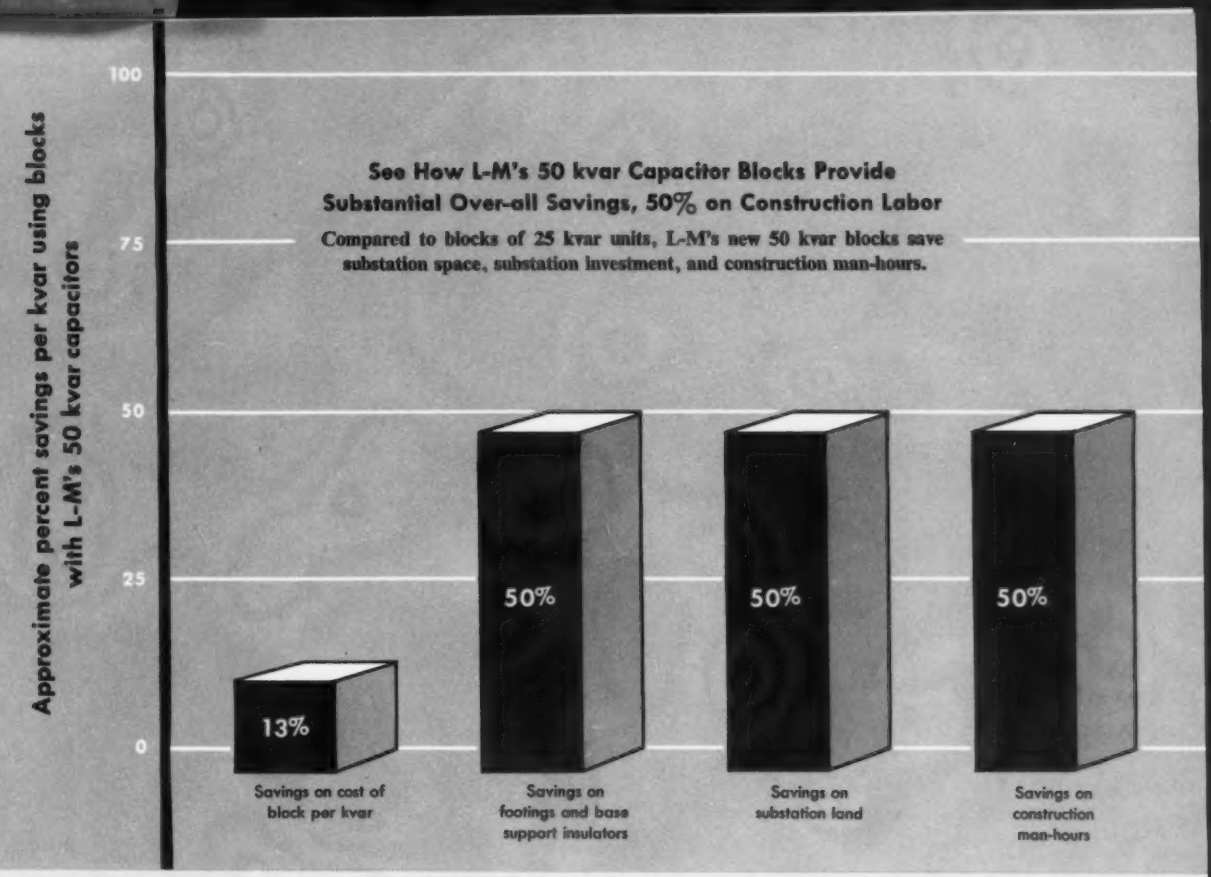
1. Aluminum-alloy bus
2. Bus-mounted fuses
3. Bus connections wire brushed and treated with oxidation inhibitor.
4. Jig-assembled for perfect alignment of mounting pad bolt holes.
5. Lifting lugs.
6. Tapped holes in frame for capacitor mounting bolts. Nuts not needed.

7. Outer support bracket permits tilting and removal or replacement of capacitor unit from side of frame.

L-M's new 50 kvar factory-assembled block has approximately the same area as a 25 kvar block with the same number of units and it is only 5 inches higher. Capacitors in L-M's 50 kvar blocks can be removed and replaced by simply tilting and sliding the capacitor from the side of the block. It is not necessary to lift the capacitor out from between the mounting members.

LINE MATERIAL

A McGRAW ELECTRIC COMPANY DIVISION


See How L-M's 50 kvar Capacitor Blocks Provide Substantial Over-all Savings, 50% on Construction Labor
Compared to blocks of 25 kvar units, L-M's new 50 kvar blocks save substation space, substation investment, and construction man-hours.
Approximate percent savings per kvar using blocks with L-M's 50 kvar capacitors
100
75
50
25
0
13%
50%
50%
50%
Savings on cost of block per kvar
Savings on footings and base support insulators
Savings on substation land
Savings on construction man-hours

Another L-M First...

L-M's New 50 Kvar Capacitor Blocks Provide Kilovars At Still Lower Costs

By **BLAINE SCHULTZ**
Chief Engineer
Capacitors and Regulators
Line Material Company

Only half as many units are required in substation capacitor banks when you use L-M's new blocks of 50 kvar capacitors. In addition, these blocks reduce the number of fuses, footings, and base support insulators, as well as the construction man-hours required for any given-size bank. L-M 50 kvar preassembled capacitor blocks also cost less and require about 50% of the substation area per kvar in comparison with blocks containing 25 kvar capacitors.

Capacitor Unit

The internal construction of L-M's 50 kvar capacitor is identical with that of the 25 kvar unit except for the length of pack. There is no increase in voltage stress to get the higher kvar rating. The new design is the result of continued improvement in dielectric materials and manufacturing techniques.

The tank has the same width, same thickness as the 25 kvar capacitor. Only 10 inches of additional height give you twice the capacity. It also has aluminum-metallized coating under alkyd resin paint; paragroove clamp-type terminals; strong solder-sealed bushings; and low-temperature Elemex liquid dielectric.

Factory-Assembled Blocks

L-M offers a complete line of NEMA Standard 50 kvar factory-assembled blocks from 2400 through 7960 volts—400 to 1200 kvar ratings in 100 kvar increments.

Outstanding features of L-M factory-assembled blocks include:

- Aluminum-alloy bus which is not subject to cold flow.
- Bus-mounted capacitor fuses with stainless-steel flipper to eject the leader if fuse link ever blows. Leader cannot hit live parts.
- Connections to the bus are wire brushed, and treated with oxidation inhibitor.
- Height of block is increased only 5 inches, because it is so designed that capacitors can be installed and removed from the *side*. It is not necessary to provide clearance to lift the capacitor out from between the mounting members.
- Heavy galvanized frame is jig-assembled for perfect alignment of mounting-pad bolt holes.

Prompt Delivery Now

You can save on the cost of equipment, man-hours, and space in the substation when you specify L-M NEMA Standard 50 kvar capacitor equipments. Prompt delivery now on all sizes and voltage ratings. Ask your L-M Field Engineer for complete information on L-M's new 50 kvar factory-assembled capacitor equipments. Or write Line Material Company, Milwaukee 1, Wis.

Elemex® Capacitors

more ▶

L-M Offers Application Engineering Service

L-M's service includes design of protective and control schemes for single- and multi-step banks, and complete capacitor equipments.

Line Material development engineers are experienced in the design and application of any size or type of capacitor bank for operation at transmission or distribution voltages. L-M will supply information on protective and control schemes, and will cooperate with utility company engineers to assure the best capacitor bank designs.

Single- or Multi-Step Switching

Careful consideration is given to both electrical and economic factors in the selection of single- or multi-step capacitor banks. These factors include fault-current and over-voltage relationships, number of units in parallel for any series group, step-switching sequences, grounded or ungrounded neutrals, and capacitor switch limitations.

Protective Schemes

L-M development engineers will recommend link sizes for fusing individual units and for capacitor bank group fusing; also current, voltage and time-delay relay schemes and alarm circuits as required.

Control Schemes

L-M will design voltage, current, time, kilovar, or temperature sensitive control schemes or any combination to best fit your system.

L-M engineers will cooperate with you in working out the most satisfactory capacitor application designs.

Other Line Material Capacitor Equipments

L-M's complete line of capacitor equipments includes pole-mounted 25- and 50-kvar capacitor racks—pole-mounted secondary capacitors—submersible secondary capacitors.

All Line Material capacitors incorporate outstanding product features such as aluminum metallic coating under a primer and finish coat of alkyd resin paint, strong solder-sealed bushings, and low-temperature Elemex liquid dielectric.

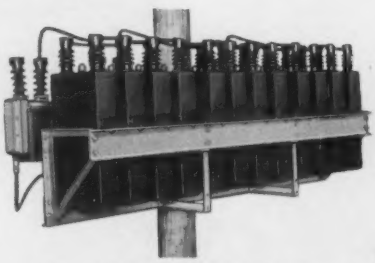
25 and 50 kvar Capacitor Racks

L-M's pole-mounted capacitor racks are factory-assembled and wired, ready to install on distribution systems rated 2400 to 13,800 volts. New 50 kvar racks are available up to 450 kvar switched and 600 kvar unswitched multi-row racks; up to 600 kvar switched or unswitched single-row racks.

New 50 kvar racks have less weight and require less space on the pole per kvar compared to 25 kvar racks. A 600 kvar 7200 volt switched single-row rack weighs only 31% more than a 300 kvar rack with 25 kvar units.

Pole-Mounted Secondary Capacitors

L-M's 240 volt secondary capacitors are available in 3, 5, and 7½ kvar. The units are small, light, and rugged; easy to install on crossarm or direct pole mounting. Shipping carton permits inspection and testing without removing capacitors from the carton.



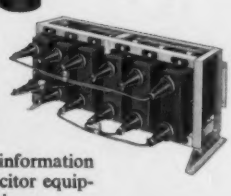
L-M's new 50 kvar capacitors in 600 kvar switched pre-wired pole-mounted rack.

Submersible Secondary Capacitors

L-M's new 216 volt, 13⅓ kvar submersible capacitors are available in 40, 80, and 120 kvar racks, entirely assembled at the factory and ready for installation. Racks are designed for a minimum space requirement and can be passed through a 30-inch diameter manhole.

3, 5, and 7½ kvar 240 volt secondary capacitors. 10 kvar units will be available soon.

Height 13¾" 3 kvar
18⅜" 5 kvar
23½" 7½ kvar



80 kvar submersible secondary capacitor equipment

Get More Information—Ask your L-M Field Engineer for information on features, design and delivery on L-M's complete line of capacitor equipments. Or write Line Material Company, Milwaukee 1, Wisconsin.

LINE MATERIAL Elemex® Capacitors

A McGRAW ELECTRIC COMPANY DIVISION

1 **"INCH-MARKED"** Length of tube is marked in feet and inches on all popular sizes. Eliminates problem of laying flat rule on round surface. Also by aligning proper marks on tube with calibrations on the Republic Bender, it's easy to obtain exactly the right height of bend.

2 **"GUIDE LINED"** Extends full length of tubing. By lining up with arrows on Republic Bender, it is easy to help keep bends in the correct plane, avoid costly "wows." With Guide Line and "Inch-Marks," accurate, properly located bends are easy to make—every time. On all popular sizes.

2 EXCLUSIVE FEATURES that make Republic ELECTRUNITE E.M.T. easier to install

Inside Knurling makes wire-pulling easier, too!
Another exclusive feature available on all popular sizes. Republic's exclusive ball-bearing inside surface is the secret. Makes wire-pulling up to 30 per cent easier.

• Thanks to these highly popular features, electrical contractors all over the country are using more and more Republic ELECTRUNITE® Electrical Metallic Tubing in all types of installations. They like the ease of installation—the good results—the savings in time and tubing.

Ductile, smooth-bending, top-quality Republic E.M.T. makes it easy to meet schedules for any type of construction. It's 100% approved for concrete-slab construction by the National Electrical Code.

On your next job, regardless of size, you can reduce waste and costs by installing Republic ELECTRUNITE "Inch-Marked" E.M.T. When ordering from your electrical distributor just ask for Republic—the E.M.T. that's "Inch-Marked"® and "Guide Lined." Send coupon for literature providing complete information.

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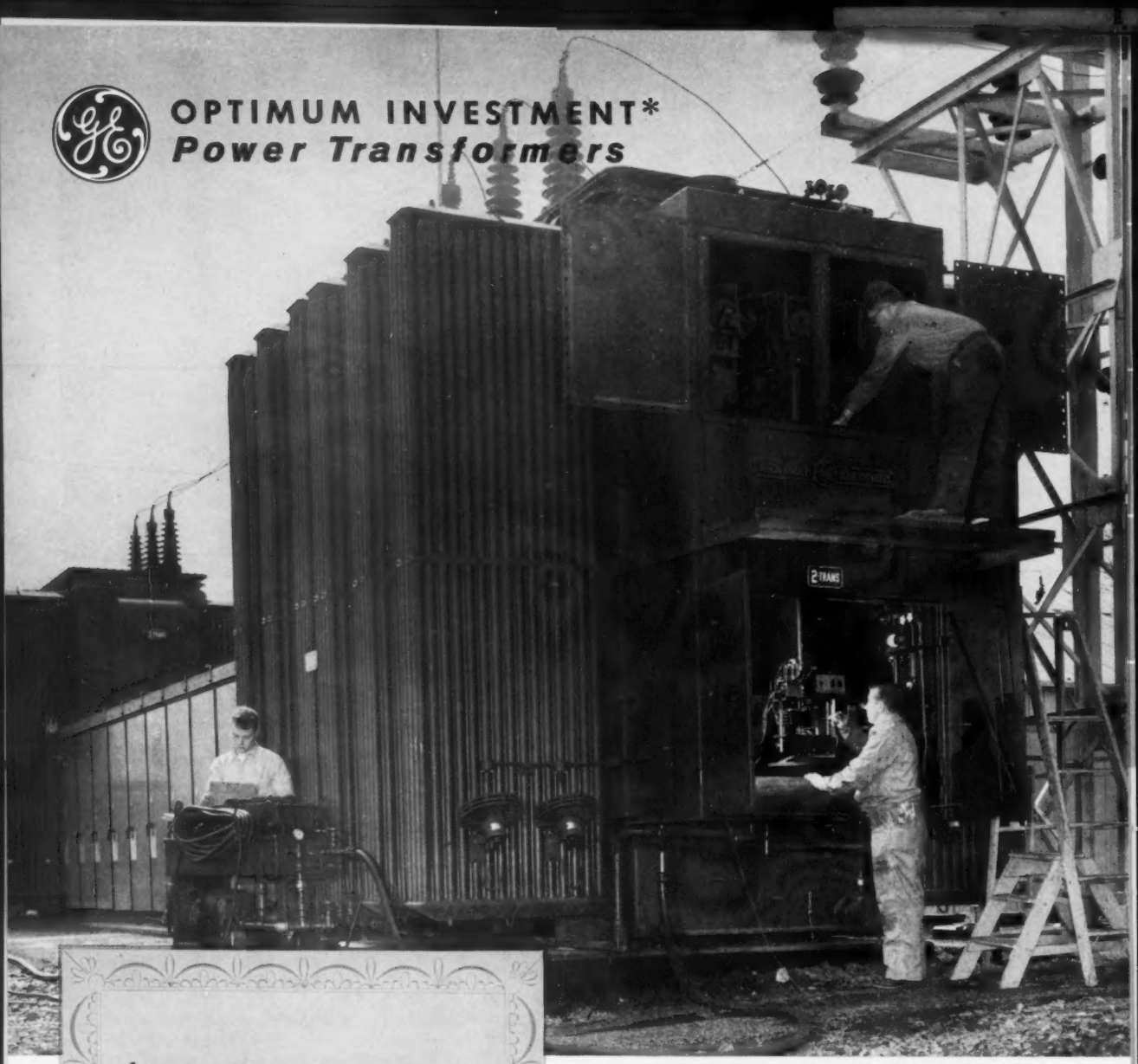
OPTIMUM INVESTMENT*
Power Transformers

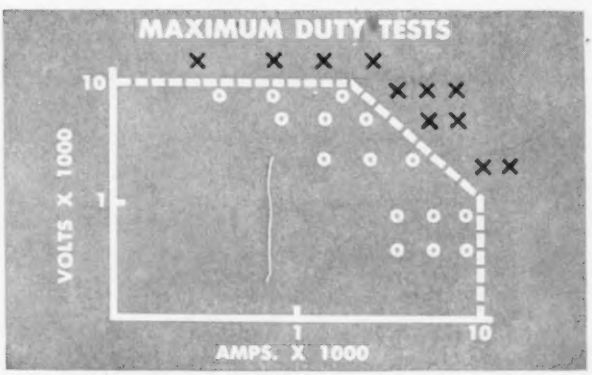


*Optimum Investment

Your assurance of lower long-term cost, plus greater dividends from your investment in General Electric large power transformers, through:

- **LOW ENGINEERING COST:** G-E field services reduce your engineering expense.
- **LOW PURCHASE COST:** Skill to produce optimum design for each application.
- **LOW INSTALLATION COST:** Upright shipment, one-piece tank speeds handling.
- **LOW OPERATING COST:** Permanent, better characteristics for lasting economy.
- **LOW MAINTENANCE COST:** Product improvements, greater reliability reduce outages.

G-E LTC EQUIPMENT now has 4 times the tip life of 1936 mechanisms. Maintenance, when needed, is simplified by hinged doors, roomy accessibility, and reusable Nitrile gaskets. Shown above is 15,000-kva, 69-kv unit.



SHORT-CIRCUIT DUTY is an important, extra feature of G-E LTC equipment. Each mechanism is thoroughly tested and applied only where test data (circles) proves ability to successfully operate under short-circuit conditions.

In the next five years . . .

Utilities will save $2,000,000 capitalized cost of reduced load-tap-changer maintenance

300% increase in LTC contact life in 20 years results from improved General Electric product features

Utilities have reported they spend an average of $200 each time they inspect and/or maintain LTC equipment. This is necessary about every three years. Yet today, General Electric load-tap-changers have an average of four times the tip life, for equal applications, compared to twenty years ago. On this basis and for the number of LTC equipments General Electric will ship in the next five years, assuming a 12% capitalization rate, electric utilities will save over $2,000,000 capitalized cost of LTC maintenance.

New and better design features developed by General Electric have made such savings possible. Heavier and thicker Arconite contact tips wear longer before replacement is necessary. Electrostatic shielding along panels and insulating rods breaks up creepage paths and eliminates the need for sporadic maintenance. Electrical and mechanical soundness is proven by the ability of mechanisms to complete a tap change even under short circuit—with no damage.

These and other G-E advances, such as those that reduce repaintings and prolong oil life, reduce your maintenance expense. And, combined with other features that give you low operating, purchase, engineering, and installation costs, they make your General Electric Power Transformer an *Optimum Investment*. General Electric Co., Schenectady 5, New York.

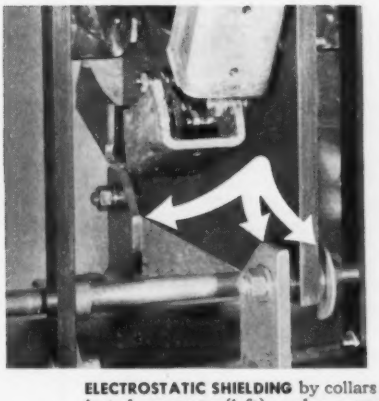
421-41

IMPROVEMENT OF LOAD-TAP-CHANGER PERFORMANCE

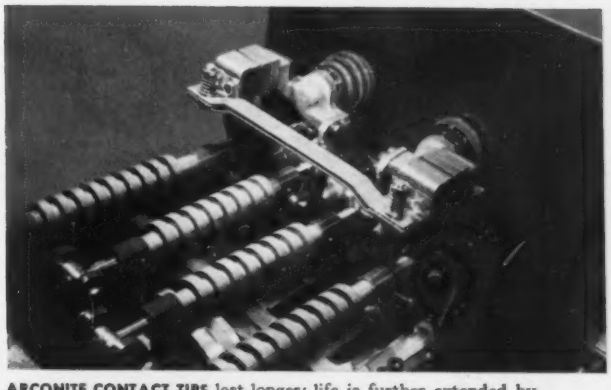
TYPICAL TRANSFORMER APPLICATIONS			EXPECTED TIP LIFE—Number of Operations	
KVA —MAX.	HIGH VOLTAGE —KV	RANGE —Per Cent	1936	1956
10,000	69 GR Y	±10	55,000	500,000
25,000	67 △	±10	70,000	140,000
55,000	115 GR Y	±10	30,000	160,000
92,000	110 GR Y	±10	40,000	65,000
166,700 (output)	230 GR Y	±7.5	24,000	50,000

Progress Is Our Most Important Product

GENERAL ELECTRIC



ELECTROSTATIC SHIELDING by collars (right), washers and projected supports (left), reduces excessive maintenance cost by diverting "particle-attracting" electrostatic stress so creepage paths are not formed along insulation.



ARCONITE CONTACT TIPS last longer; life is further extended by controlling contact speed. Life of contacts, insulation, and mechanical parts; plus normal and short-circuit duty requirements, are completely co-ordinated for every application.

Are you in generation? Transmission? Distribution? System operations?

Move ahead faster as a skilled electric utilities technician!

Get the COMPLETE picture of utility equipment and practices you need to win better-paying jobs

Electric System Operation
Electric Transmission & Distribution
Electric Generation Hydro, Diesel, and Gas-Turbine Stations
Electric Generation Steam Stations

Now you can fill in the essential technical background you need to advance quickly in this wide-open field. Do it easily—**on your own**—with the help of this down-to-earth Library.

In straightforward language, this Library gives you the practical facts, ideas, and methods most electric utilities use to solve their operating problems successfully.

Expert engineers in the field carefully explain every step in electric generation. They show you the workings of entire steam, hydro, and diesel stations as well as gas-turbine stations . . . answer all your questions about transmission and distribution systems . . . show you how to handle each of the operations involved in scheduling and maintaining equipment to produce electric power economically and efficiently.

Everything you need to understand the utility as a whole is covered—hundreds and hundreds of working facts and methods on such topics as . . . boiler control . . . equipment scheduling . . . load dispatching . . . rate schedules . . . how circuit breakers and generators are controlled . . . how internal combustion engines and gas turbines work . . . how fuel is selected and transported to the boiler furnace.

Experienced utility men planned this Library especially for spare time training. They take nothing for granted—start you right from scratch. Simple arithmetic is the only math used. Any man aiming for a technical utility job or advancement will find it smoother going with this thorough, helpful tool.

Helps you do better work in such jobs as:

Lineman	Operator
Repairman	Dispatcher
Service man	Maintenance mechanic
Installer	Engineering assistant
Technical clerk	Record tracer

and many others

Technicians Needed!

"We hear much about the demand for engineers. One obvious remedy is to increase the number of well-trained engineering technicians. Many times we find engineers doing jobs that could be performed as well, at least in part, by technicians. The best figures now available call for at least five engineering technicians to each professional engineer on the engineering team. Our current situation is almost the reverse — four engineering graduates to each technician. This doesn't mean we need fewer engineers. Rather, it means the engineers will need more coworkers."

From an editorial in POWER

THE McGRAW-HILL

Electric Utility Power Library

Edited by BERNHARDT G. A. SKROTZKI
Associate Editor, *POWER*

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Ideal for the newer engineer facing his first practical assignment, and all technicians looking for advancement.

Electric Generation
STEAM STATIONS

Describes in simple terms the basic principles of the steam-electric generating stations. You get the facts on selecting fuel, design and operation of steam generators and fuel-burning equipment, piping, turbines, condensers, treatment of feedwater and cooling water. Explains how electric generators work and are cooled —including instrument and automatic control systems —auxiliary systems, and superpressure steam stations.

Electric Generation
HYDRO, DIESEL, AND GAS TURBINE STATIONS

Deals with central stations other than steam-electric, describing their fundamentals, their distinctive equipment and operations, and their part in the whole electric supply system. You see how various types of hydraulic turbines and gas turbines work, how they are arranged and controlled. Operation, arrangements, and control of internal combustion engines are made plain, along with switching equipment, transformers, voltage regulators, etc.

Electric Transmission and Distribution

Gives you a sound idea of actual layout of equipment used in transmitting and distributing electric energy —from generating station to customer's connection. Clearly explains overhead and underground circuits, capacitors, transformers, auxiliaries, street lighting, means of protection, etc. Packed with specific facts on such matters as methods of eliminating lamp flicker, conditions that fix current carrying capacity of cable, restarting network after shutdown, maintenance of circuit breakers, etc.

Electric System Operation

Shows you how equipment is scheduled for operation, how it is maintained, and how energy may be interchanged between systems with resulting savings. You get a detailed picture of how relays work, how equipment is put in and taken out of service, how utility system load curves are used, communications between system personnel. Gives you basic principles of incremental rates, shows how rates are calculated, how different forms are used to charge for service, etc.

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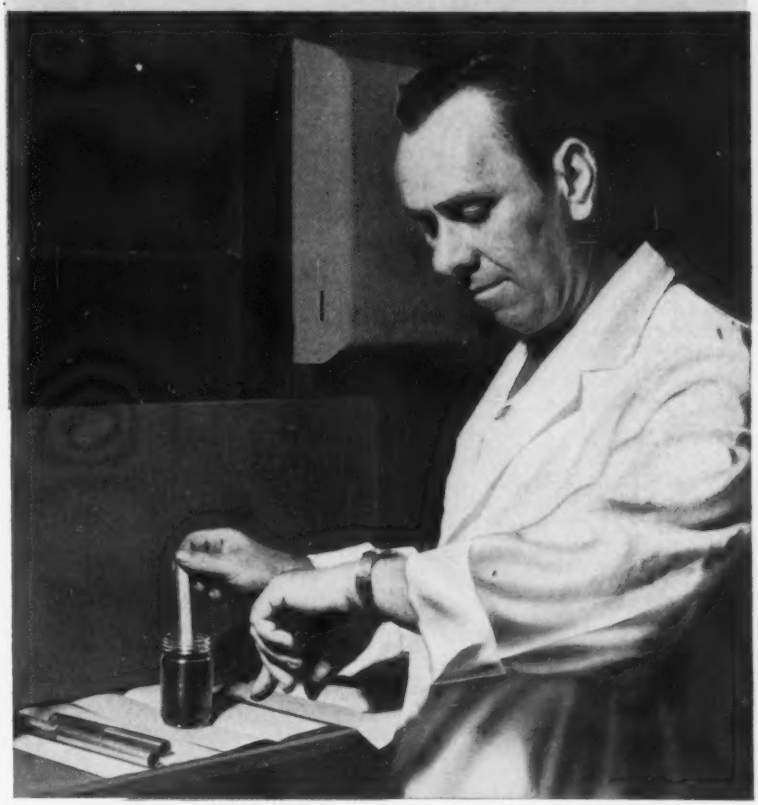
This is Foreman Joe Wojtalewicz, a member of SPANG's inspection team at Etna. He checks the plating thickness of each lot of SPANGLEAM EMT by means of the Preece Test to be sure the finish more than meets minimum requirements, giving you a top-quality finish on your SPANGLEAM order.



JOE tests the SPANGLEAM finish for YOU!

You don't know Joe Wojtalewicz, but he is one of your personal representatives at SPANG's Etna Plant. Joe makes sure the SPANGLEAM EMT you order has a *top-quality* finish that more than meets the requirements of Underwriters' Laboratories, Inc., American Standards Association and Federal Government specifications WW-T-806b. Here's how he does it.

The Preece test

From each lot of SPANGLEAM EMT produced, Joe chooses a length at random and subjects a small sample of it to the Preece Test. The sample is dipped in a UL-prepared solution of copper sulphate for one minute and then washed in water. This is repeated three more times.

If the finish breaks down during the test, the entire lot is discarded. But if the finish passes, Joe okays the lot for shipment. SPANGLEAM finish will generally stand more dips than required by Underwriters' Laboratories. That's proof of SPANG's *quality-control* manufacturing!

Careful control means better installations for you

Because SPANG maintains such close control on finishing SPANGLEAM Electrical Metallic Tubing, you benefit three ways:

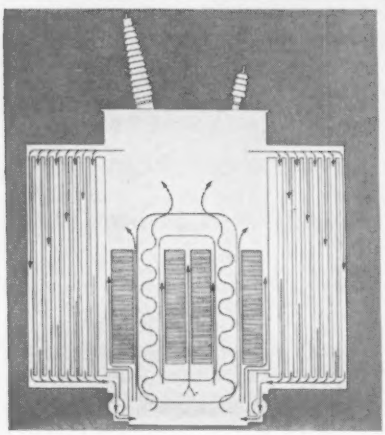
1. The SPANGLEAM finish stands up under the severest bending strains . . . will not crack, chip, flake or peel.
2. The fine plating finish gives SPANGLEAM EMT excellent corrosion resistance . . . prolongs the life of wiring installations.
3. In exposed locations, the lustrous SPANGLEAM finish makes a neat, attractive appearance.

If you haven't used SPANGLEAM EMT, try it now and get the benefits of SPANG *quality-control*. Ask your nearby SPANG Distributor for SPANGLEAM on your next EMT order. You'll know it has Joe's okay!

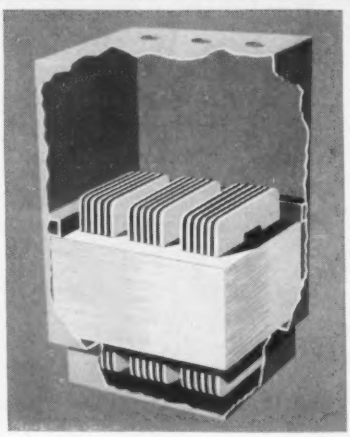
SPANG CONDUIT

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE:
TWO GATEWAY CENTER, PITTSBURGH, PA.
District Offices and Sales Representatives in Principal Cities

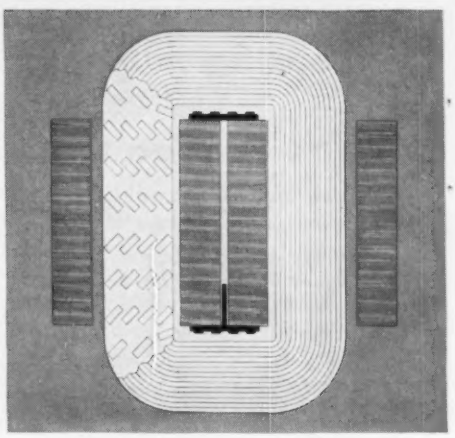
World's largest—400,000-kva, 330-kv, Westinghouse Form-Fit auto transformer in operation at Indiana & Michigan Electric Company's Tanners Creek plant, Lawrenceburg, Indiana.



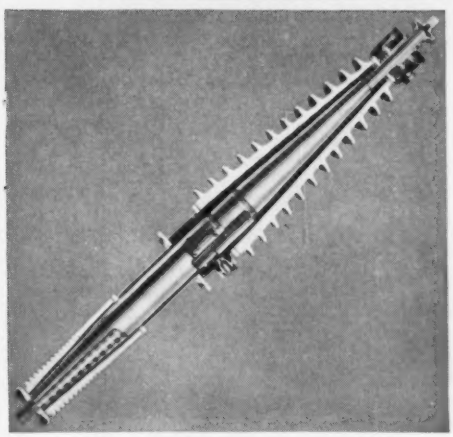
High Thermal Capacity—Forced-oil cooling improves performance of heat transfer system . . . prolongs transformer life by reducing hot spot temperatures, boosts capacity by as much as 67% and results in smaller, lighter weight transformers.



Space, Weight Saver—Close-fitting, rugged tank withstands rough handling; provides compact, low-weight unit which can be shipped upright. Design also reduces weight and maintenance of coolant oil normally required in greater quantities in other types of construction.



Improved Performance—Shell-form design puts core iron on the outside, coils on the inside. Natural vertical cooling arrangement improves thermal characteristics; creepage surfaces are eliminated; voltage oscillations are reduced for improved dielectric characteristics.



Proved Dependability—More than 200,000 Westinghouse condenser bushings have been in operation for a total of a million bushing years with a 99.98% perfect service record. Result: greater protection and more dependable service continuity for your system.

At Record Breaking Capacities . . .

Here's How Westinghouse Brings You Long-Term Economy in Power Transformers

Westinghouse engineering brings you long-term economy in power transformers by constantly increasing capacity while making practical reductions in size and weight. These improvements have been effected through development of better materials and a more efficient design arrangement.

Strong evidence of success in this effort is the Westinghouse line of "Form-Fit" power transformers which are smaller and lighter per kva than any other design.

These transformers use steel cores made of Hipersil®, a cold-rolled silicon steel which has superior magnetic properties—very high permeability and very low losses. In the Westinghouse shell-form design, the core surrounds, supports and protects the coils, giving them added mechanical strength.

To provide utmost reliability, Westinghouse now impulse tests all power transformers, rated over 10,000 kva and 69 kv, right on the production line. This exclusive quality-control measure assures you that transformers delivered will be free of defects and capable of giving continuous service.

Westinghouse leadership in design engineering is your assurance of superior power transformer performance. Get in touch with your Westinghouse sales engineer, or write Westinghouse Electric Corp., 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa. J-70755

YOU CAN BE SURE...IF IT'S

Westinghouse

Any way you look at it...

INSULATING'S EASIER WITH SCOTCH ELECTRICAL PRODUCTS!

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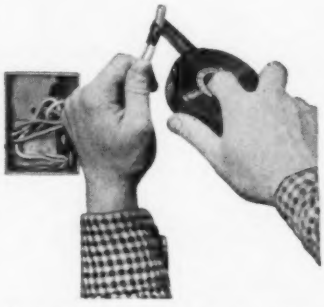
That's *right*—insulating's easier, cleaner, less expensive with "Scotch" Brand Electrical Products. Modern materials and methods are working for you. Figure it out for yourself: any workman of average skill can turn out expert results with "Scotch" Electrical Products—in less time than an expert would take with old-fashioned insulating materials. Want to know how many different ways you can save with "Scotch" Brand? Just drop a card to 3M, Dept. BU-106, St. Paul 6, Minnesota. Do it today!

"SCOTCH" BRAND PLASTIC ELECTRICAL TAPE NO. 33 is one of the "Scotch" Brand Plastic Electrical Tapes with tough vinyl backings. No. 33 is super-thin, yet does the job of two ordinary insulating tapes.

"SCOTCHLOK" BRAND ELECTRICAL SPRING CONNECTORS are the tightest-gripping wire connectors on the market! Spring tension grips tight, can't shake loose. Just twist on, snap off winding stem and the splice is made!



Neat and compact splices are easy with "Scotch" 33 and "Scotchlok."

"SCOTCHFIL" BRAND ELECTRICAL INSULATING PUTTY comes in a roll, applies like tape. It's the *easy* way to fill voids and pad sharp edges on cable connectors, motor terminals and bus bars. Will not corrode copper.

"Scotchfil" gives extra-heavy protection to splice made with "Scotchlok."

"SCOTCHCAST" EPOXY RESINS cure quickly into a solid, moisture-resistant insulation with maximum protection against mechanical and electrical stresses. Now in "UNIPAK" container for field application in splicing kits.

Activated "Scotchcast" is poured into mold over splice. Quick and easy!

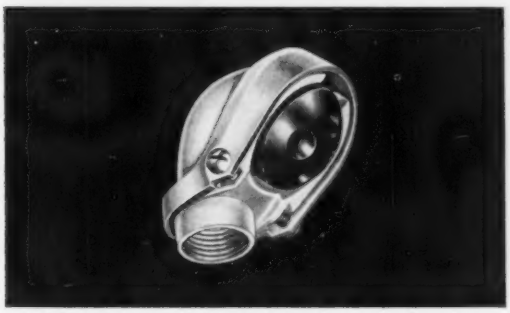
"SCOTCH" BRAND ELECTRICAL INSULATING TAPE NO. 27 is a glass-cloth tape with true thermosetting adhesive. High-heat operating conditions actually cure adhesive to form a permanent bond of great strength. Never rots or shrinks.

PRODUCT OF 3M RESEARCH

The term "Scotch" is a registered trademark of Minnesota Mining and Manufacturing Company, St. Paul 6, Minn. Export Sales Office: 99 Park Ave., New York 16, N. Y. In Canada: P.O. Box 757, London, Ontario.

3M COMPANY

COMBINATION ENTRANCE CAPS Here's a real "2-in-1" entrance cap ... approved by Underwriters' Laboratories for both rigid conduit and EMT... permits stocking of one cap for two purposes... eliminates threading of rigid conduit. Comes in sizes from ½" to 2".



THREADED CONDUIT ENTRANCE CAPS Like most other Gedney entrance caps, this one is made of malleable iron to prevent breakage... hot dip galvanized for maximum service life. Sizes range from ½" to 6".

ENTRANCE CAPS For S.E. Cables—with key hole mounting bracket. Easy to assemble—cable slips into cap and is securely held by clamping shoe. Has split insulator and well bushed holes. Overlapping cover protects cables from weather. As there is little strain on this fitting it is made of malleable iron.

Cross the threshold to lower costs...with GEDNEY ENTRANCE CAPS

Malleable Iron—Hot Dip Galvanized

THESE ENTRANCE CAPS install faster—and cut your *final* costs right down to rock bottom. Like all Gedney Fittings they're accurately machined and threaded...smooth finished, with no burrs or metal particles. On top of that, the Gedney line includes many improved design features that bring extra efficiency and labor savings. For fittings that bring today's lowest installed cost, specify Gedney!

GEDNEY FITTINGS FIT

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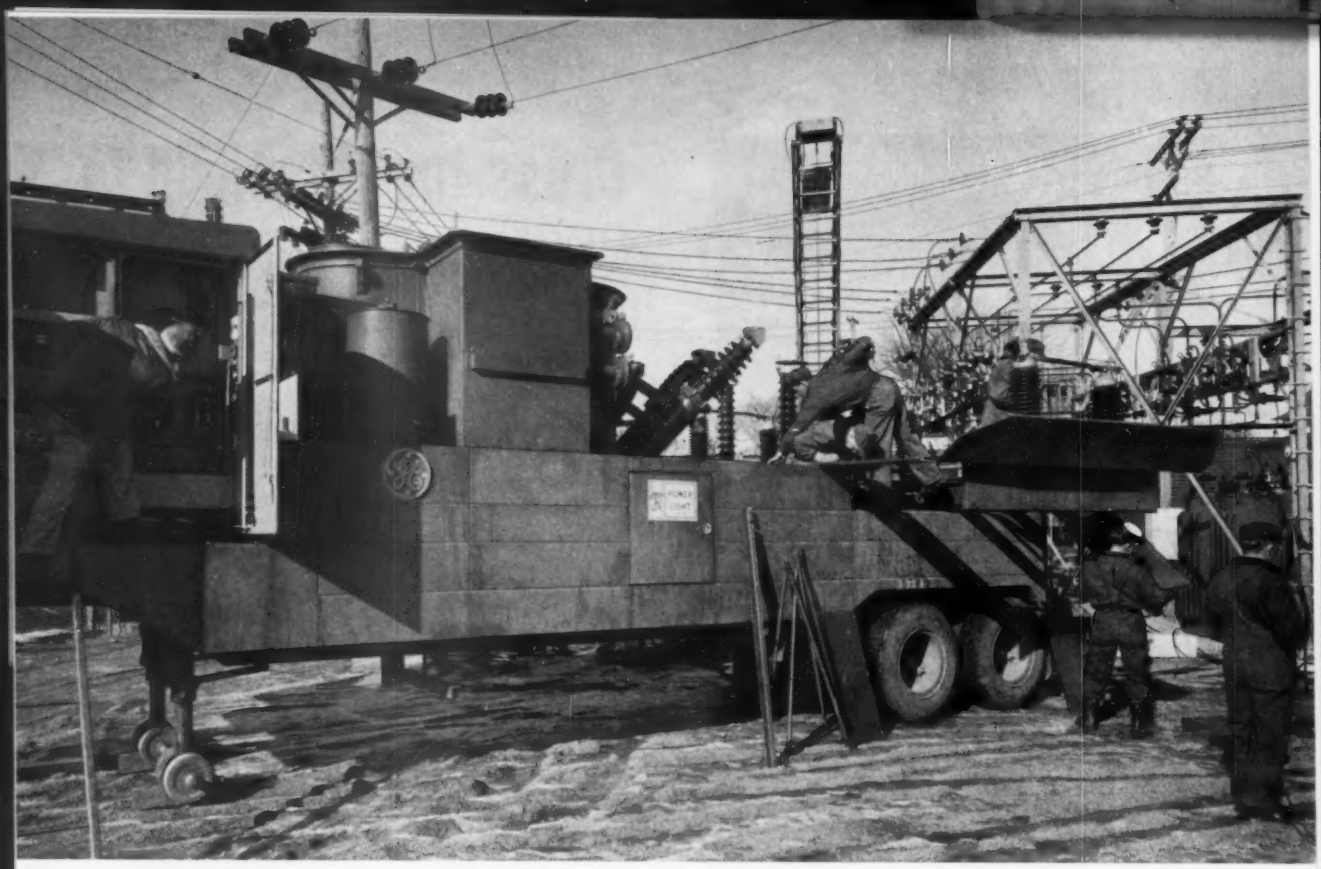


GENERAL ELECTRIC Mobile Unit Substation

PAYS FOR ITSELF by reducing routine system maintenance expense

"We certainly feel that this unit is paying for itself during routine maintenance. Variations in voltage make it adaptable in many locations for a variety of jobs." This statement by Mr. Anthony Zanskas, Assistant Superintendent of Substation Construction and Maintenance, Wisconsin Power and Light, expresses the findings of many progressive utilities.

"Labor and material savings, by using the mobile unit substation for by-passing entire small substations for maintenance and transformer changes have been great, as we have been able to do this work on de-energized busses and equipment with a minimum amount of material and preparation and without any delay or outages." This additional endorsement by Mr. Carl Takle, Wisconsin P & L's Superintendent of Substation Construction and Maintenance, further demonstrates how General Electric mobile unit substations are paying off as a versatile, economical means of speeding routine system maintenance, in addition to their value as stand-by or emergency equipment.

General Electric mobile unit substations are designed for maximum versatility, with provision for various voltage combinations, if required, to meet all application needs. Each substation is a complete, fully coordinated unit, mounted on a high-speed trailer, designed for normal highway operation. For further information, contact your local G-E Apparatus Sales Office or write for bulletin GEA-4415 to General Electric Co., Schenectady 5, N. Y. 422-26

Typical six-months' operating log for Wisconsin P & L's 5000-kva G-E Mobile Unit illustrates high utilization factor. All these stops were for routine maintenance.

Location	Installed	Removed	Days	Mileage
Oregon	2–22–55	3– 6–55	13	25
Tomah	3–10–55	3–16–55	7	110
Prairie Du Chien	3–18–55	3–18–55	1	94
Baraboo	4–19–55	4–23–55	5	98
Fox Lake	5– 7–55	5–18–55	12	35
Janesville	6– 7–55	6–29–55	23	82
Mauston	7–12–55	7–19–55	8	100
Dorset	7–21–55	7–22–55	2	10
Darien	8–11–55	8–11–55	1	120
Portage	8–19–55	8–20–55	2	90
Evansville	8–23–55	8–23–55	1	45

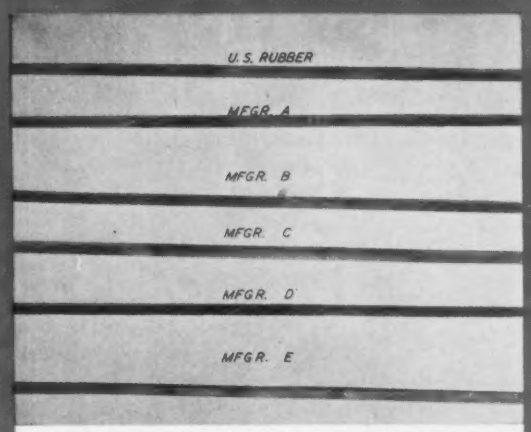
SIX-MONTH TOTALS: 11 Locations
75 Days in Service—809 Miles Traveled

Progress Is Our Most Important Product

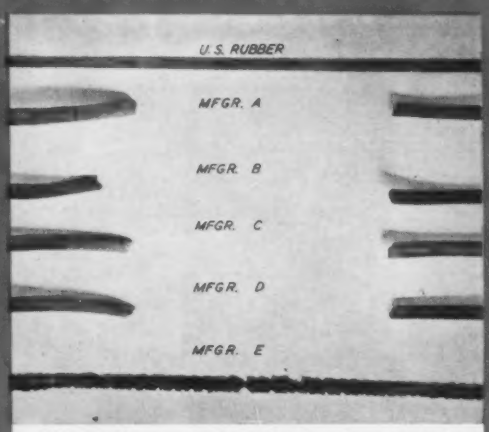
GENERAL ELECTRIC

US RUBBER

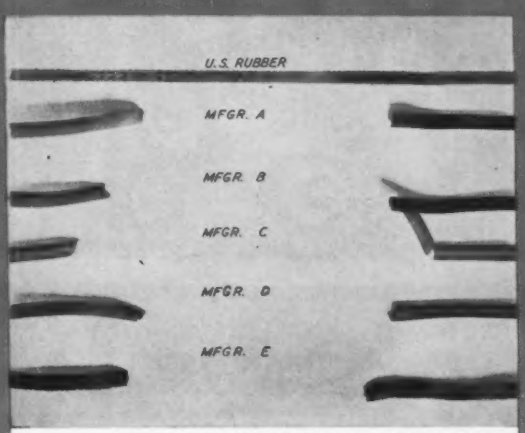
Grizzly High Voltage Power Cables



Here are 6 samples of widely used competitive neoprene jackets (stretched 200% of original length) at start of test for ozone resistance.



2 hours, 23 minutes after start. Brand "E" is disintegrating. Brand "B" has failed 13 minutes ago; the other brands failed an hour or more before.



Taken 7 hours after start of test—Brand "E" failed after 2 hours, 30 minutes. U. S. Grizzly Power Cable's jacket showed practically no sign of damage. It did not fail until after 18 hours of exposure.

Proved far and away the winner in an Ozone test of 6 leading competitive jackets!

U. S. Grizzly® High Voltage Power Cables are unmatched in performance, durability and all-around economy. Order these superior cables from your "U. S." branch, distributor or write Electrical Wire & Cable Department, United States Rubber Company, Rockefeller Center, New York 20, N. Y.

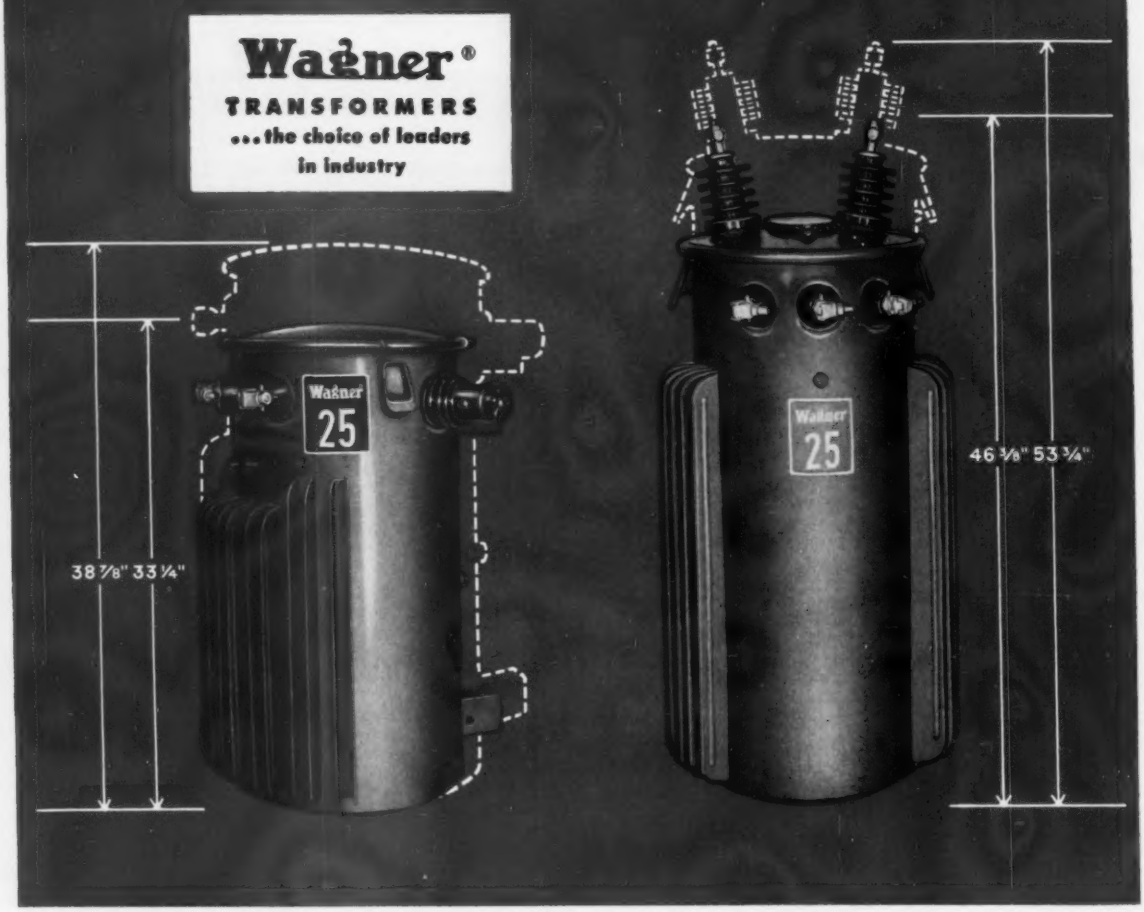
Obsolete wiring can cause power failure, step up expense and push down your production. That's why it's important to make sure your plant is equipped with Adequate Wiring—adequate not only for today's needs but also for the increased electrical loads needed in your future growth.

US RUBBER

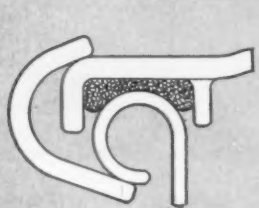
Electrical Wire & Cable Department

United States Rubber

Wagner®
TRANSFORMERS
...the choice of leaders in industry



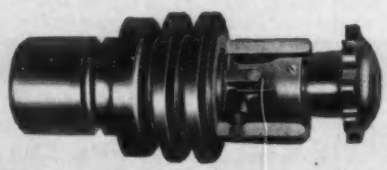
SHUR-SEAL CLAMPING RING



Keeps transformer sealed air-tight . . . no atmospheric moisture or dust particles can get inside. Spring action of lip and ring maintain pressure on gasket. Cover may be removed by loosening a single bolt.

HIGH VOLTAGE SIDEWALL BUSHING

For use with either copper or aluminum conductor . . . safety-designed for faster, easier connections, without tools. Porcelain and terminal are locked in position.



MECHANICAL FEATURES

The rating of each of these new transformers is clearly shown on the tank. There are fewer sharp edges and brackets on the tank where rust can start . . . lifting lugs are curved and rounded.

In the 25, 37½ and 50 Kva ratings, cooling fins increase the radiating surface. The 75, 100 and 167 Kva ratings are provided with tubes.

Wagner

Distribution Transformers

smaller-lighter-easier to handle and install

Now Wagner Form W Distribution Transformers are substantially smaller and lighter than ever before... up to 25% shorter in the important overall height dimension—17% lighter in weight. Yet they are liberally designed for excellent electrical performance.

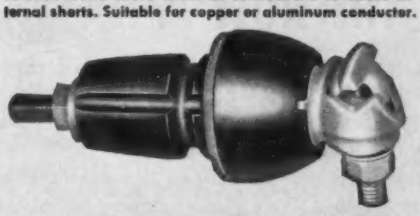
This means greater ease of handling—speedier installation. It also means that you can save money by putting greater transformer capacity on your existing structures... handle heavier loads without installing new poles. All these new Form W Transformers, in ratings 15 through 167 Kva, 15 KV and below, can be pole mounted.

Such reductions in size and weight are made possible by improvements in core and coil construction. A special resin coated insulating material is used for layer, channel and barrier insulation. Heat treating bonds this insulation to the coil conductors to give the coils exceptionally high mechanical and electrical strength.

These new, lighter shorter Form W Transformers will meet your distribution requirements. Consult the Wagner Sales Engineer in your area for complete information.

LOCKED LOW VOLTAGE BUSHING

The bushing and terminal are key-locked to prevent rotation... no loose terminal connections to cause internal shorts. Suitable for copper or aluminum conductor.



INHIBITED OIL

—reduces oxidation to a minimum... retards formation of acids and sludge.

Wagner Electric Corporation EST. 1891

WAGNER ELECTRIC CORPORATION
6381 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

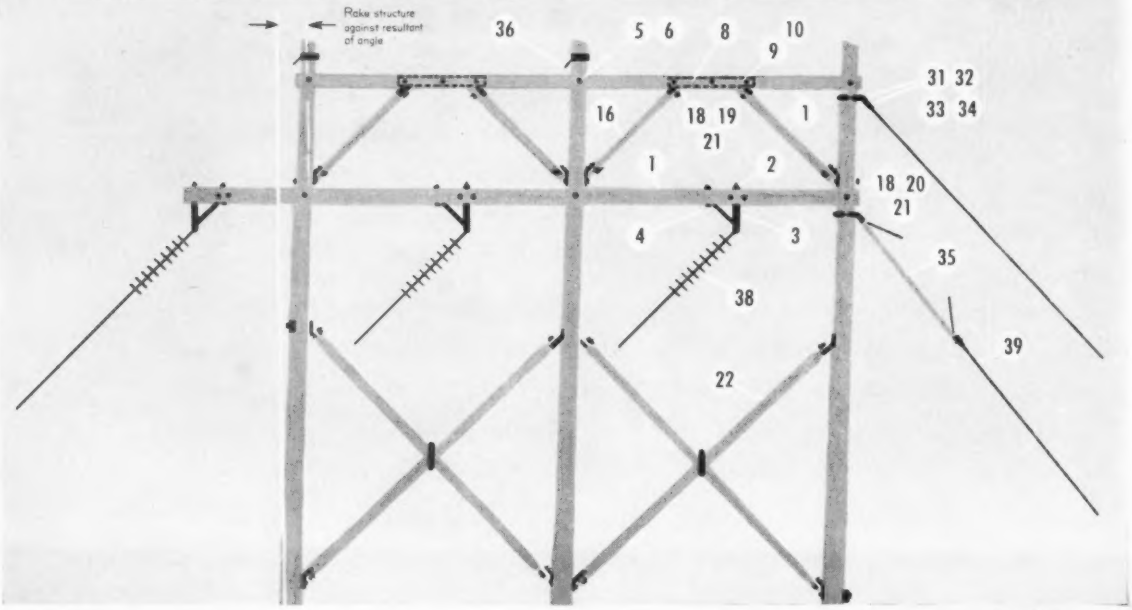
BRANCHES IN 32 PRINCIPAL CITIES

T56-12

SMALL ANGLE STRUCTURE TYPE NO. 706

NORMALLY USED FOR ANGLES OF 4° — 15°. ADAPTABLE FOR VOLTAGES FROM 69 TO 154 KV

DRG. REF=	QUANTITY	DESCRIPTION	DRG. REF=	QUANTITY	DESCRIPTION
706	3	Pole	21	7	MF locknut ⅞"
1	4	Crossarm	22	2 sets	Cross base w/fittings, clamp, ⅞" pole bolts, and curved washers
2	3	Spacer fitting w/mfg. bolts			
3	3	Swinging angle bracket			
4	3	Saddle w/mfg. bolts	31	4	Pole band
5	6	Stud bolt ⅞" w/2 washer nuts	32	4 pr.	Connecting link
6	12	MF locknut ⅞"	33	1	Guy roller
8	2	Filler block	34	1	Machine bolt ¾" x 2½"
9	6	Stud bolt ¾" w/2 washer nuts	35	1	Wood guy strain insulator
10	12	MF locknut ¾"	36	2	Suspension clamp for static wire
16	4	Knee brace			
18	7	Machine bolts ⅞" w/sq. nut	38	As required	Suspension insulators and fittings
19	4	Flat washer 4" sq. x ¼", 1 13/16" hole	39	—	Guying material
20	2	Curved washer 4" sq. x ¼" 1 13/16" hole			



FROM THE TOP OF THE POLE TO THE BOTTOM OF THE HOLE . . .

ORDER via Graybar

Graybar will deliver complete pole line structures "packaged"—ready to assemble—to the job site.

All fabricating and boring of arms has been done. Hardware is attached. You're assured that every member fits perfectly.

The result? A better structure planned and assembled according to *your* specifications.

The cost? Much lower than that of field assembly. And there's no lost motion in getting the right parts to the job on time.

To complete the "package", Graybar's experienced Outside Construction specialists and field representatives are always ready to help you tackle tough or unusual jobs along with regular service.

Remember, call Graybar *first*—for any transmission or pole line project. We'll gladly furnish help, advice, complete quotations and quality materials engineered and manufactured to assure uninterrupted service to your customers.

611-84

GRAYBAR ELECTRIC COMPANY, INC.
420 Lexington Avenue, New York 17, N. Y.

Call Graybar first for...

Everything Electrical — Graybar Electric Company

IN OVER 130 PRINCIPAL CITIES

Prometheus, one of the earliest characters in classical mythology, gave the gift of fire to mortals and was punished for this infringement on the gods. He was bound to a rock to be devoured by an eagle and by the elements. But Prometheus persevered over all. His name still symbolizes enormous endurance over incredible hardship.

ENDURANCE BREEDS CONFIDENCE

Symbols that clearly show unusual endurance over the elements are uncommon. The mythological Prometheus represents strong day-after-day endurance. There's another such symbol, too . . . but not fictional. Kerite Cable, year in, year out, successfully resists the damaging effects of time and the elements. Whether exposed to the humid heat of the tropics, or the rigors of the cold damp Arctic, Kerite, wherever it is used, can be relied on for outstanding performance. That's why there is little cause for surprise when Kerite Cable laid in unusually difficult installations 40 or more years ago is found still to be in perfect operating condition today. Kerite's acceptance is greatest with those who have used it longest. Endurance, over the years, breeds confidence.

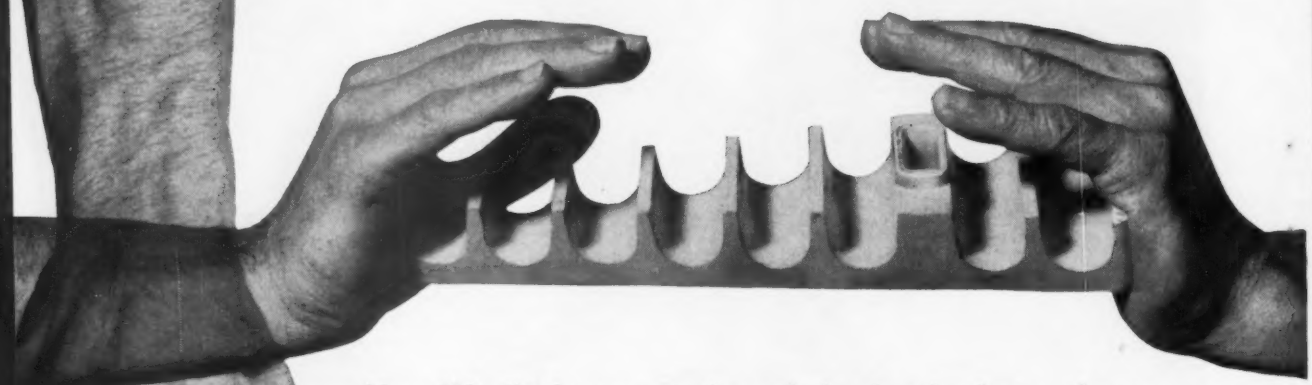
The value and service life of a product can be no greater than the integrity and craftsmanship of its maker.

Founded 1854

KERITE CABLE

THE KERITE COMPANY—30 Church St., New York 7, N. Y.
Offices also at 122 S. Michigan Ave., Chicago; 582 Market St., San Francisco;
3901 San Fernando Rd., Glendale 4, Calif.; 31 St. James Ave., Boston

70% STRONGER IN COMPRESSION
1000% MORE RESILIENT
30% LIGHTER



New Westinghouse reactor rated a hands-down winner

Remarkable Westinghouse polyester-glass is stronger, more resilient, more versatile by far than any material ever before used in reactor cleat construction. Stronger, less bulky, and with greater dielectric strength, for instance, than conventional concrete. Cleats are bonded into solid vertical columns by high-strength resin tie rods, another Westinghouse innovation. Equally serviceable indoors or out, polyester-glass is impervious to moisture or any other atmosphere condition. In short . . . damage, aging and therefore maintenance are all but eliminated.

All facts. Tough facts, too, but look what current-limiting reactors have to put up with. Forces generated by short circuits and by expansion and contraction of conductors under heavy overloads subject equipment to terrific thermal and mechanical shock.

In the battle of the short circuits the new Westinghouse dry-type reactor is a hands-down winner. For more facts, get in touch with your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70774

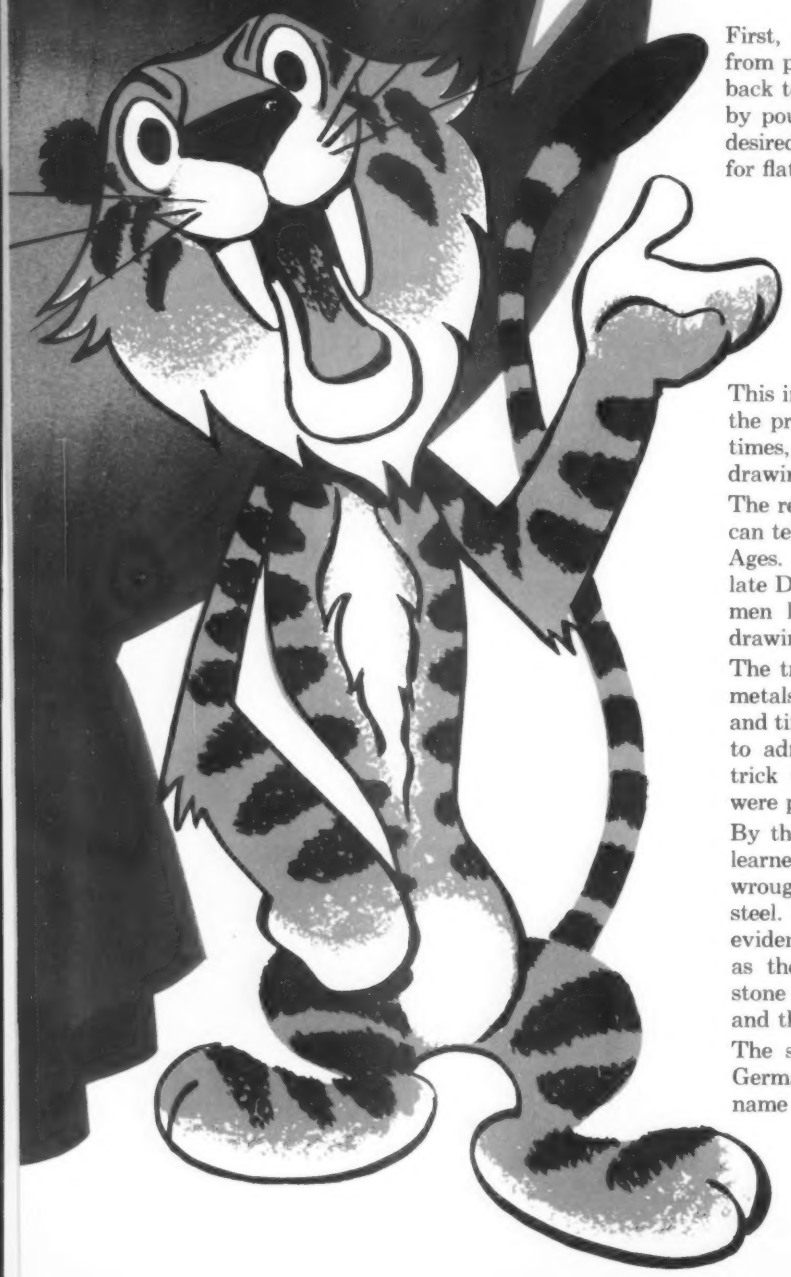
The six columns of a typical Westinghouse reactor have the compressive strength to support the weight of the largest power transformer ever built . . . 365,000 lbs.

WATCH WESTINGHOUSE!

COVER THE PRESIDENTIAL CAMPAIGN ON CBS TV AND RADIO!

AT LAST! An excuse
to tell
our favorite story!

Did you ever hear the incredible, staggering, marvelous story of how they learned to draw steel wire? Since this is our 125th anniversary, it seems an appropriate time to let you in on one of the most underplayed industrial dramas of all time.



First, a little background. Wire, mostly made from precious metals, has been found that dates back to the year 2750 B.C. It was usually made by pounding on a bar with a hammer until the desired shape was obtained. They usually settled for flat wire.

This inefficient production method gave chills to the production men even back in the Pharaohs' times, so the race was on to find a method of drawing wire through dies.

The records are kind of sloppy, but as far as we can tell, the big break-through came in the Dark Ages. Some authorities further refine it to the late Dark Ages; but suffice it to say that learned men like Theophilus were writing about wire drawing in the period from 800 to 900 A.D.

The trouble was that they could only draw soft metals like gold or a then-popular alloy of lead and tin which we know as solder today. You have to admit that it doesn't seem like much of a trick to draw *solder* through a die, but things were pretty tough in those days.

By the beginning of the 17th century, men had learned how to draw still harder metals, like wrought iron. But *nobody* could draw high carbon steel. Not that they didn't try. There is some evidence that men searched for a drawing process as they searched for the elusive philosophers' stone that would transmute lead into gold . . . and they met with the same success.

The scene shifts to the little town of Altena, Germany, around the year 1650. Our hero (his name is in dispute, but it was probably one

Johann Gerdes) had tried all sorts of wire drawing tricks. He used dozens of different die lubricants, weird types of dies, slow pulling, fast pulling, high and low temperatures. Nothing worked, so you can hardly blame him for picking up the bundle of steel rods and marching outside with them. There, he flung open the door of what might be loosely called the gents' rest room, and dumped the rods down the hatch.

Some time later, they needed more rods for the experiment, so a few hardy souls retrieved the ones that had been banished in such a dramatic manner. The rods were carried back into the little factory and they drew beautifully—the first drawn high carbon steel wire. Some profound change had taken place in the steel. They didn't know what had happened, but they liked the results.

A thriving industry grew up in Altena. And they say it was quite a sight to see the workers come in of a morning with a yoke pole across their backs, supporting a lunch bucket at one end and a common household utensil at the other—the raw materials for a day at the wire mill.

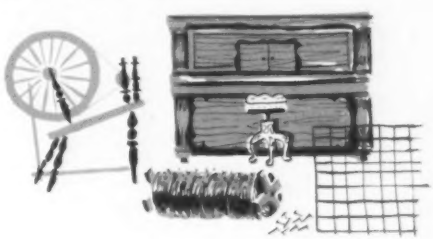
Altena enjoyed a complete monopoly on steel wire drawing for almost a century, until an obviously disgruntled worker found that dilute sour beer would also do the job. Finally, some kill-joy discovered that you could even use *water* if you did it right. The "secret" spread, and from then on, Altena had to bask in her rather impressive past glory.

On this 125th anniversary, we think we are entitled to mention that American Steel & Wire is a highly reputable organization employing about 30,000 devoted workers who really know how to do things to wire. The original company was formed in 1831 by two live-wire gentlemen named Ichabod Washburn and Benjamin Goddard, who, if they lived in this wonderful generation, would probably own half of the United States and Canada. Brilliant as these gentlemen were, the company never really started to roll until ladies became interested in hoop skirts, because this was the first true volume market for wire!

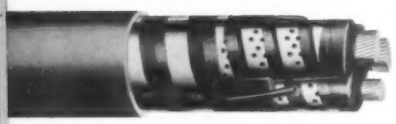
After the Civil War, the hoop skirt market went to pieces (you know how women are about fashion), and things looked pretty gloomy until barbed wire was invented around 1870. It's been one thing after another right up to the present time.

As the most knowledgeable wire maker in the USA, it was rather natural for us to begin making electrical wire and cable right at the beginning—1891 to be exact. Our salesmen frequently stumble across Tiger Brand electrical cable that has been buried in the ground or under water for 30 to 40 years and is still giving good service.

When we discuss incidents like this at our frequent sales meetings, the general comment is that our high production standards certainly don't help our replacement market very much, but fortunately, we're part of a great and growing industry. And, what with nuclear power plants and the like, there will always be a big demand for Tiger Brand Electrical Wire and Cable from buyers who want that extra margin of quality that we learned to build into our products a long, long time ago.

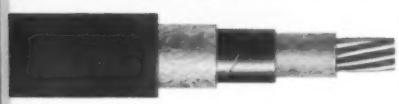


A brief summary of Tiger Brand Electrical Wire & Cable



TIGER BRAND PAPER CABLE

Premium quality cable for high voltage use. Lead sheaths are applied under high pressure to insure dense surface. Lead tanks are kept under inert atmosphere to prevent formation of impurities. All constructions available, including type GN glass, neoprene fabric jackets.



TIGER BRAND ASBESTOS CABLE

On these cables, we do *not* apply the asbestos as a twisted yarn, because the yarn will frequently open when the cable is kinked. Tiger Brand cables feature asbestos that is combed and carded, then applied as a true felt which is compressed tightly around the conductor.

TIGER BRAND VARNISHED CAMBRIC CABLE

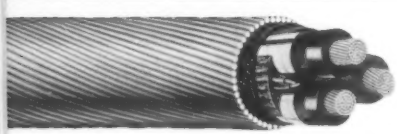
This is the great "in-between" insulation, for use where you want greater moisture resistance than paper has, and higher voltage ratings than offered by rubber insulations. In dry locations, varnished cambric can be used without a lead sheath, because it is not subject to oil drainage.

TIGER BRAND RR CABLE

Features rubber insulation and a neoprene sheath. A versatile cable—with heavy jackets—it can be buried directly in the earth. It is perfect for conduit wiring when supplied with a thin sheath. When several RR cables are combined with a bare messenger, you have a self-supporting aerial cable.

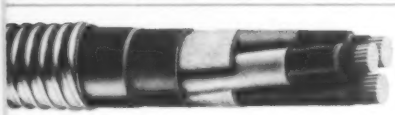
TIGER BRAND AMERCLAD

The very highest quality in *heavy-duty* portable cords and cables. All jackets are vulcanized in a lead sheath, and are permanently marked with molded identifications. High neoprene jackets show phenomenal resistance to abuse, sunlight, grease, oil or acid mine water.



TIGER BRAND SUBMARINE CABLE

Many Tiger Brand submarine cables are still in service after 30 or more years. Heavy galvanized steel armor wires are applied with long lay to resist tensile stress. AS&W pioneered in construction of aluminum armor for salt water use.



TIGER BRAND INTERLOCKED ARMOR CABLE

Available up to four-inch core diameter, with armor of steel or aluminum. Eliminates costly conduit bending and fitting. Splices can be made anywhere along the cable's length. A great money saver for plant wiring installations, especially in cramped quarters.

TIGER BRAND ELEVATOR CABLE

Cables are carefully designed to have just the right degree of flexibility so they will bend easily at the bottom of the shaft, but not so sharply that the wires will be deformed. We also supply a complete range of annunciator, lighting and signal cable, plus hatch wire for elevator shafts.

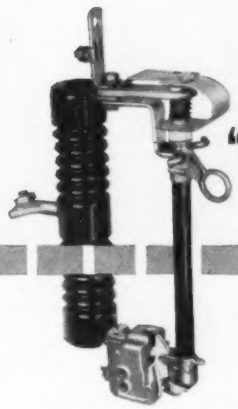
A Standard Tiger Brand Cable for every special job

AMERICAN STEEL & WIRE DIVISION • UNITED STATES STEEL

USS Tiger Brand Electrical Wire & Cable

Now...clear 12000 amps

WITH AN OPEN CUTOUT



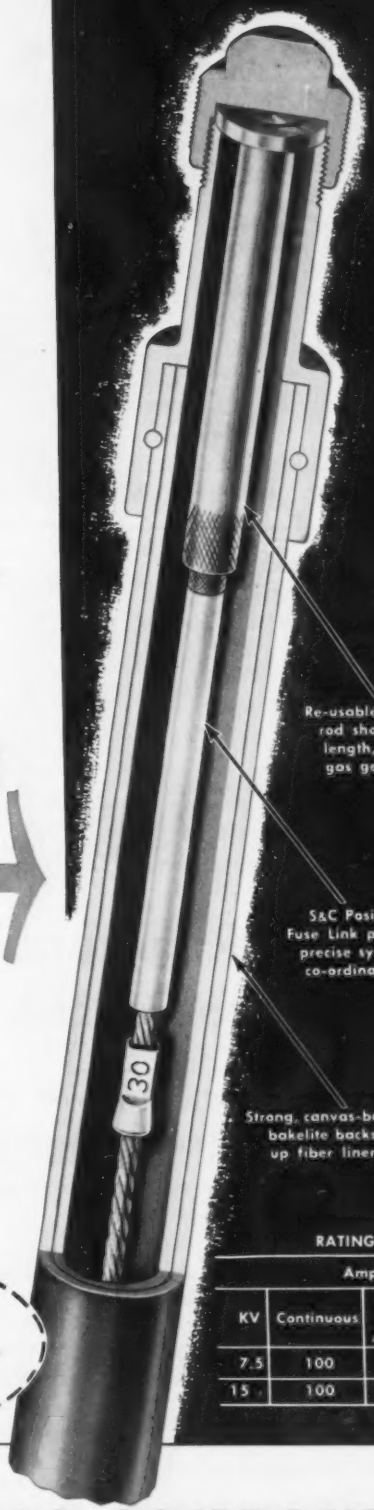
AT ONLY "EXTRA HEAVY DUTY" COST

S&C's Open Cutout—Type XS—with a newly developed fuse tube—provides the higher interrupting capacity needed on some of your distribution feeders . . . without sacrificing linemen's safety . . . without double-venting . . . without resorting to an oversize bore . . . and without a cost premium.

This high interrupting capacity is achieved through two new developments which result in (a) minimizing the energy developed within the fuse tube and (b) absorbing this reduced energy in a unique recoil mechanism. Low fault interruption has not been sacrificed either. It is assured by a strong, fast-acting flipper.

Specialists in High-Voltage Circuit Interruption since 1910

Handles lightest faults, too!


Re-usable extension rod shortens arc length, reduces gas generation
S&C Positrol Fuse Link permits precise system co-ordination
Strong, canvas-base bakelite backs up fiber liner
30

RATINGS

Amperes		
KV	Continuous	Interrupting (RMS, Asymmetrical)
7.5	100	12000
15	100	10000

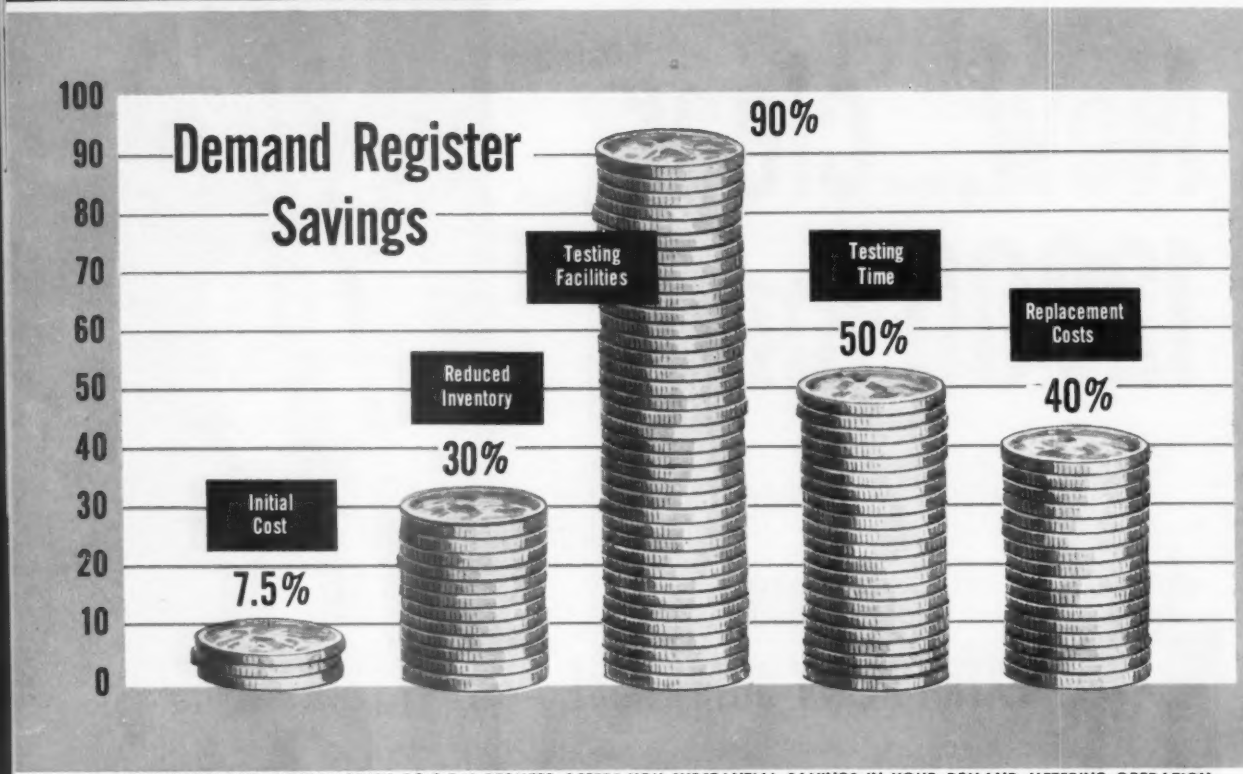
S&C ELECTRIC COMPANY

4425 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

DEMAND METERING



VERSATILITY AND DEPENDABILITY OF G.E.'S REGISTER OFFERS YOU SUBSTANTIAL SAVINGS IN YOUR DEMAND METERING OPERATION

Demand Registers: The Most Economical Means to Reliable Demand Metering

- Versatility of demand register offers reduced inventory costs
- On the line testing and maintenance assure lower operating costs
- Accuracy of register is unchanged during life

The many cost-saving features of General Electric's demand register offer you assurance of reduced metering costs. The flexibility of the demand register makes possible a 30% savings in reduced inventory, while the interchangeability of the register provides a 40% savings in replacement costs.

These savings plus the dependable, accurate operation of G.E.'s mechanical demand registers have led to its increasing acceptance by the utility industry. Since 1952, this acceptance has been marked by an increase of 70% annual sales of demand registers, as compared to but a 40% increase in the total demand meter market.

REGISTER FLEXIBILITY . . . The versatility of design of General Electric's demand register offers the opportunity of converting the register to different scale classes, electrical ratings, or time intervals. Standardization on one register ratio with a change in only the multiplier is but one of the many cost-saving methods which is available with only a demand register.

REDUCED INVENTORY . . . The opportunities for reduced inventory are substantial with the use of demand registers. Any stock single-phase or polyphase watthour meter can be converted to a demand meter merely by substituting a demand register. This adaptability which results in reduced inventory and operating costs is unique with demand registers.

IN SERVICE . . . A watthour meter can be readily converted to a demand meter simply by the interchanging of registers. Also, quick,

easy, accurate and low-cost field testing can be realized with demand registers. With the use of a G-E self-checking adapter, the need for elaborate testing equipment is eliminated and costly hours of labor are greatly reduced.

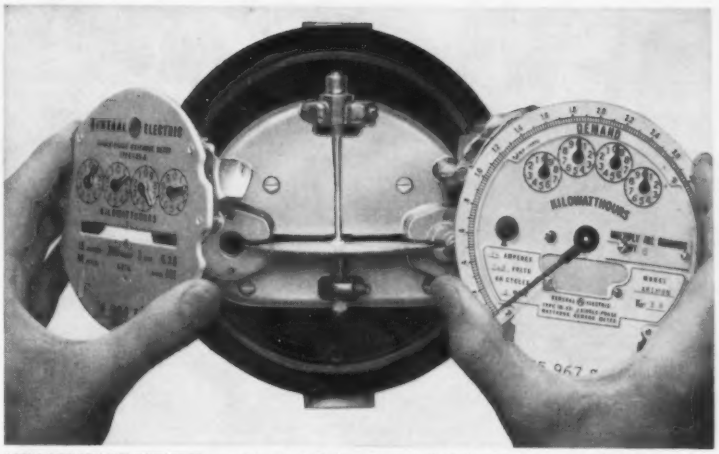
REDUCED TESTING . . . General Electric engineers have released test results which give assurance of increased reliability of demand registers. These tests show that the life of the register rotor has been extended up to 10 years. This fact means that the register will need testing and maintenance only during periodic meter tests.

DIRECT GEAR DRIVE . . . Not only is the register on the same testing basis as the meter but also the demand register possesses the same stability of calibration as the meter. This high accuracy remains unchanged during life, and thus assures reliable operation for years. In comparison with other types of demand metering devices, the register is relatively unaffected by such variables as friction and climate.

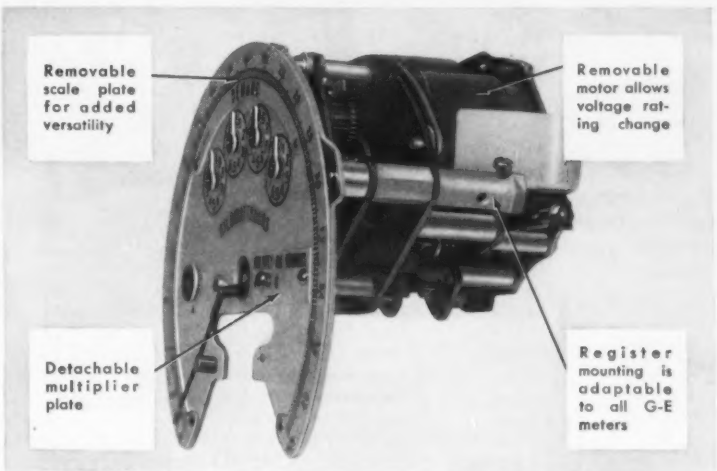
These facts offer you the greatest possible assurance that General Electric's demand registers are your most reliable means to low-cost demand metering.

MANY UTILITIES . . . Increasing numbers of utilities are taking advantage of the benefits offered by demand registers. Here are but a few: Commonwealth Edison Company, Wisconsin Electric Power Company, Kansas Power and Light Company, Duke Power Company, Pacific Gas and Electric Company, Southern California Edison Company, Public Service Company of Oklahoma, and New Orleans Public Service Inc.

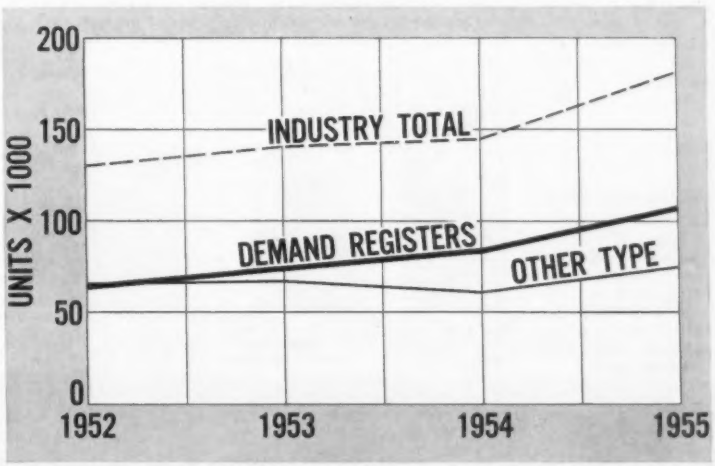
FOR MORE INFORMATION . . . If you would like more information on General Electric's mechanical demand registers, write to Section 621–13, General Electric Company, Schenectady 5, N. Y.



VERSATILITY OF REGISTER provides installation on any G-E single-phase or polyphase meter.


Removable scale plate for added versatility
Removable motor allows voltage rating change
Detachable multiplier plate
Register mounting is adaptable to all G-E meters

FLEXIBILITY OF DESIGN allows change in scale classes, electrical ratings, and time intervals.



INCREASING USE of demand registers has resulted from the dependable low-cost operation.

Progress Is Our Most Important Product

GENERAL ELECTRIC

With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

NEW! Exclusive! Different!

BELL
SAF-T-LOK
WEATHERPROOF OUTLET
FEATURING *Exclusive*
SNAP-COVER
ACTION!

❶ Lid opens at finger-touch . . .

❷ STAYS OPEN IN SAFETY-LOCKED POSITION . . .

❸ Closes *automatically* with slight push to left!

(Illustrated No. 210 — One-Gang SAF-T-LOK Receptacle) Pat. Pending

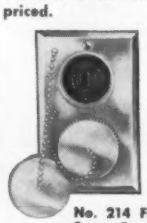
U.L. APPROVED

Exclusive SNAP-COVER *locks open* for easy one-hand insertion of plug—allows use of free hand to hold heavy electric tools. Cover does not rest on plug or wire, preventing damage to wire insulation or plug cap if cord is jerked out. COVER CANNOT BE LOOSENED OR PULLED OFF. Plate .040 solid Brass with Cast Metal cover, Baked Aluminum finish —all parts rust-proof. Attractively boxed with rubber weatherproof gaskets and mounting screws.

ORDER TODAY from the MOST COMPLETE LINE of 1 and 2-Gang Weatherproof Wiring Devices: Receptacles, Switches, and Combinations with SAF-T-LOK SNAP COVERS or SCREW COVERS — all competitively priced.

No. 216 Flush Switch — Exclusive one-piece die-cast Lever eliminates many extra working parts—provides smooth action, easy grip, added strength and durability.

No. 216 Flush Switch — (Single pole, T-rated)



No. 214 Flush Screw-Cover Duplex Receptacle

No. 230 Combination Flush Switch & Snap Cover Outlet

INCLUDE your order for Bell METAL WALL PLATES — make Bell your one source for the best in weatherproof Devices and Wall Plates!

Write for Catalog and Prices today!

BELL ELECTRIC CO.
1844 West 21st Street • Chicago 8, Ill.

ELECTRICAL BOOKS

ELECTRIC UTILITY RATE ECONOMICS, *236 pages, 6x9, by Russell E. Caywood, McGraw-Hill Book Co., $10.*

This is a practical guide to the many economic and technical factors involved in electric utility rate making. Written by the manager of rates of West Penn Power Co., the book serves as a reference and a working tool for rate men of all degrees of experience. Topics discussed include the theoretical basis of the price structure and the tariff, engineering economics and cost analysis, the rate department, earnings, utility plant, depreciation and rate of return.

LINEAR TRANSIENT ANALYSIS, *452 pages, 6x9, by Ernst Weber, John Wiley & Sons, $10.50.*

Following Vol. 1 of the same title, this book presupposes a knowledge of the functions of a complex variable and familiarity with simple lumped circuits. However, five appendices provide mathematical background and help make the text self-sufficient. It is a mathematical presentation, but several applications are given in detail and problems are solved for illustration.

ASTM STANDARDS ON ELECTRICAL INSULATING MATERIALS, *656 pages, 6x9, American Society for Testing Materials, $6, $4.50 to members.*

Specifications and test methods covering various electrical insulating materials are included in this report. There are 12 revisions and two new items since last issue.

THE GENERATION OF ELECTRICITY BY WIND POWER, *318 pages, 6x9, by E. W. Golding, Philosophical Library, $12.*

Considered in this book is the economy of wind-generated electricity in relation to large supply networks, as well as applications for isolated premises. The author is in charge of Britain's Rural Electrification and Wind Power Department of the Electrical Research Assn. Behavior of wind, and techniques for measuring it are discussed.

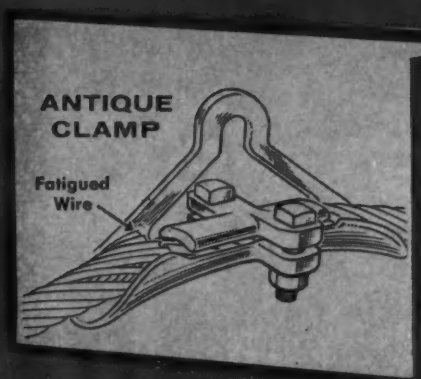
FACTORY ELECTRIFICATION, *398 pages, 6x9, by F. T. Bartho & C. H. Pike, Philosophical Library, $12.*

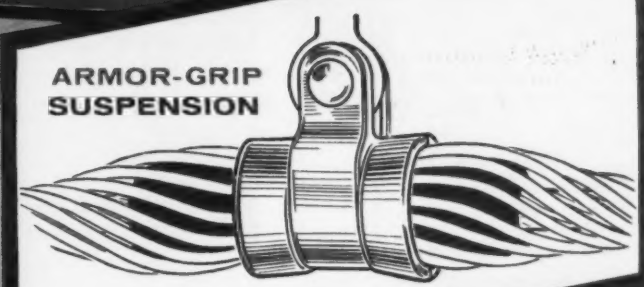
Executive engineers concerned with the installation and maintenance of electrical plant and factory electrification will find this book of value. It provides a general guide to the selection and use of electrical equipment for factories, treating the subject in a practical manner. Easily understandable by those familiar with the elements of theory and practice of electrical engineering.

EEI-NEMA STANDARDS FOR WET-PROCESS PORCELAIN INSULATORS, *15 pages, 8½x11 paper, EEI No. TDJ-58; NEMA No. 146-1956, 30c.*

This is a report of the joint committee of the Edison Electric Institute and the National Electrical Manufacturers Assn. on insulator standards. The number and design of units necessary for normal construction activities are given. Use of the standards will benefit stock simplification and other advantages of interchangeable equipment.

"PERFECTING not PERFECTION is our goal" *





"they both suspend the conductor, BUT . . ."

. . . *yesterday's answers* are not good enough. Today's will need improving tomorrow.

Take the problem of vibration fatigue. Failure of strand because of vibration or galloping does not occur in mid span. But it becomes a real problem at points of stress concentration, such as the end of the clamp keeper—at mass concentrations, such as at clamps, dampers and rigid splices—or at wearing points at loose attachments or fastenings.

Yesterday's answer—Preformed Armor Rods, introduced by Preformed Line Products Company in 1947.

Today's answer—PLP Preformed Armor with pitch direction the same as conductor strand and pitch length less than that of strand (Patent No. 2,609,653). When used in conventional clamps:

- it extends uninterrupted conductor life
- it eliminates wear possibilities
- it prevents excessive mass and stress concentrations

Tomorrow's answer is here today: the Preformed armor rod principle carried one step further in Preformed's ARMOR-GRIP SUSPENSION (Patent No. 2,722,393), the entirely new concept in suspension design.

The Armor-Grip Suspension Unit is a "floating suspension"—the conductor is cradled in neoprene and firmly gripped only by the custom-designed Preformed Rods which distribute their pressure over a relatively large area. The result: no wear possibilities—no mass concentrations—*and no clamping stress concentrations.*

This is another example of PLP research laboratories at work. Ever improving methods, materials and solutions is our goal. Call a PLP Representative today and ask for a demonstration.

* *John Dewey, "The Reconstruction of Philosophy"*

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.

PLP

PREFORMED LINE PRODUCTS COMPANY

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

TELEPHONE: CLEVELAND EXPRESS 1-3571

PRODUCT NEWS

New Designs and Applications

Service Truck Toolbox

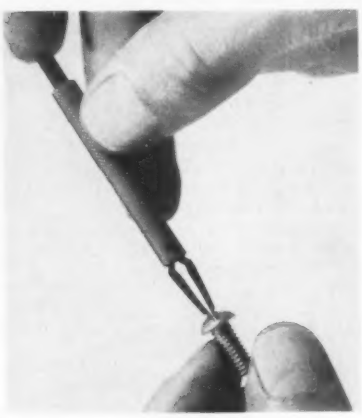
(1) Wilhelmsen Sheet Metal Works, 4459½ Tweedy Blvd., South Gate, Calif.

Tool boxes that can be attached to all standard pickup trucks are now available from this manufacturer. Boxes are constructed of 14 and 18 gage steel. Compartment for half-ton trucks are 13 in. x 15 in. x 71 in.; for three-quarter ton trucks the length is 85 in. Available with either one or two doors.

Weatherproof Outlet

(2) Pass & Seymour Inc., Boyd Ave., Solvay, Syracuse, N. Y.

A weatherproof duplex outlet, complete with its own mounting box has been developed by this company. Cover and plate gaskets and rubber grommet are furnished with the device. Has positive latching aluminum alloy caps to seal unit when not in use. Box is of cast aluminum. Installation is made with only one drilled hole.



Screw-Holding Driver

(3) H.J.J. Co., 268 Marlow Drive, Oakland 5, Calif.

Twin bits that expand to grip the screw slot are said to aid the starting of screws in difficult places. When the screw has been started, the driver is removed by tapping a release rod at the top. Manufactured in a variety of lengths, the new driver has blade widths and thicknesses to handle from No. 0 to No. ¼ slotted screws.

Stab-Lok Circuit Breakers

(4) Federal Pacific Electric Co., 50 Paris St., Newark 1, N.J.

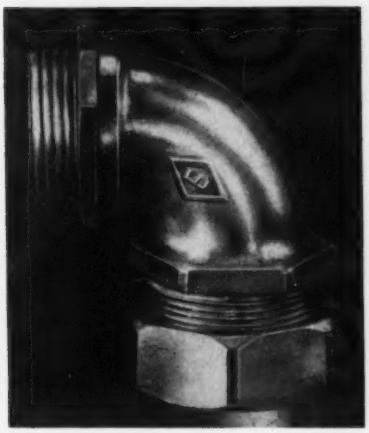
Flexibility is the keynote of this new circuit breaker series. The breakers have "stabs" that grip vertical bus bars to make a fast, easy installation. Designed for use in panelboards or individually-enclosed circuit breakers, the Stabreaker is said to provide simple interchanging of ratings. To make changes, pull out present breaker, disconnect side wiring, plug in new rating in same frame size and rewire. Simplicity of the plug-in arrangement is demonstrated by main photo. An advantage stated by the manufacturer is that the panel interior can be plugged in after all work is done. Power distribution panelboard requirements can be filled "over the counter" direct from stock, it is pointed out.

Service Panel Switch

(5) Wadsworth Electric Mfg. Co., Covington, Ky.

The water heater fusible pullcover assembly in this new device has its own separate compartment either for general or separate metering. Fusible pullcover construction is used in the entire assembly with 100-amp main lugs. It is a three-pole solid neutral, 120-240-v, a-c switch with 60-amp pullcovers for the range and lighting unit controls and 30-amp pullcovers for the water heater and dryer or 60 amp if specified.

For more manufacturers' bulletins and coupon for use in securing them, see page 75.



Conduit Connectors

(6) Electrical Fittings Corp., Woodside 77, N. Y.

Connecting rigid conduit to boxes without threading is possible with these new 90° and 45° connectors. Attachment of the connectors to the conduit is effected by a serrated gland ring held by a nut.

Hydraulic Tank Lifter

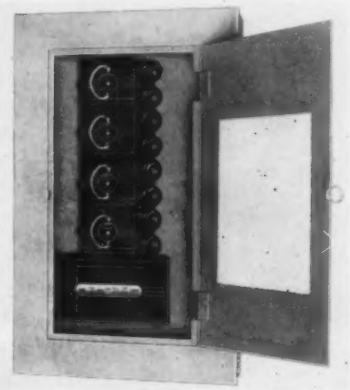
(7) Allis-Chalmers Mfg. Corp., 1126 S. 70th St., Milwaukee 1, Wis.

A new hydraulically operated tank lifter for raising and lowering oil-filled tanks of frame-mounted, outdoor oil circuit breakers has been developed by this manufacturer. Consisting of two cylinders containing pistons and a length of flexible hose, the lifter can be operated directly from the Pneu-Draulic operator of the breaker or from a portable battery-powered pump. Tanks can be stopped at any point, and maximum speed of raising and lowering is governed so that the tank is safely lowered in the event a hose is broken or fitting removed during operation.

Panelboard

(8) General Electric Co., Distribution Assemblies Dept., Plainville, Conn.

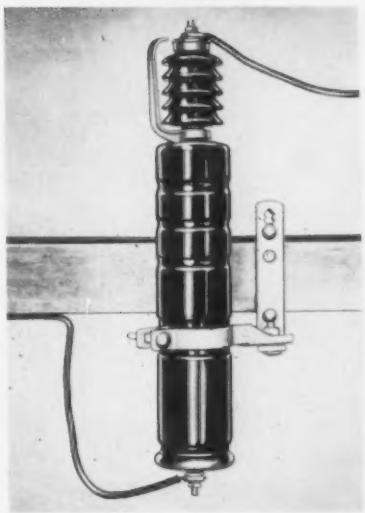
A new heavy-duty power distribution panelboard incorporating rigidly mounted fusible switch units of the quick-make, quick-break type is announced by this company. Designed for 600 v a-c maximum service, two or three wire, single phase, and three or four wire, three-phase applications.



Service Entrance Switch

(9) Clark Controller Co., American Electric Switch Division, 1146 E. 152nd St., Cleveland 10, Ohio.

Four 240-v branch pullouts, 100-amp main pullout and eight plug fuse circuits are contained in one cabinet in this new service entrance equipment. Available for surface or flush mounting, the cabinet is 21⅛ in. x 12⅞ in. x 3⅞ in.



Arresters

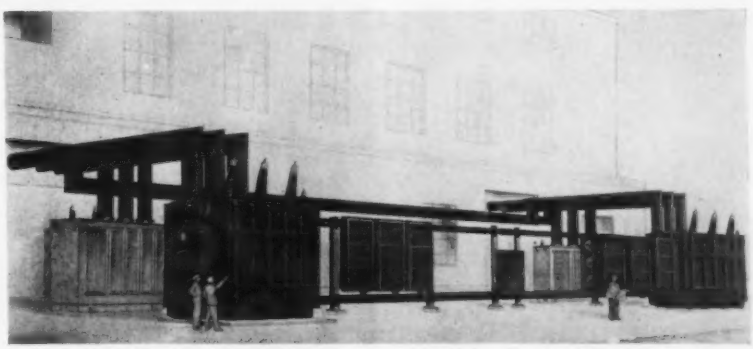
(10) Line Material Co., 700 W. Michigan St., Milwaukee 1, Wis.

Low impulse sparkover, low IR drop, limiting of 60-cycle follow current, high discharge capacity and long life are stated advantages of a new open-gap valve arrester in production by this company. Available in ratings of 3, 6, 9 and 10 kv.

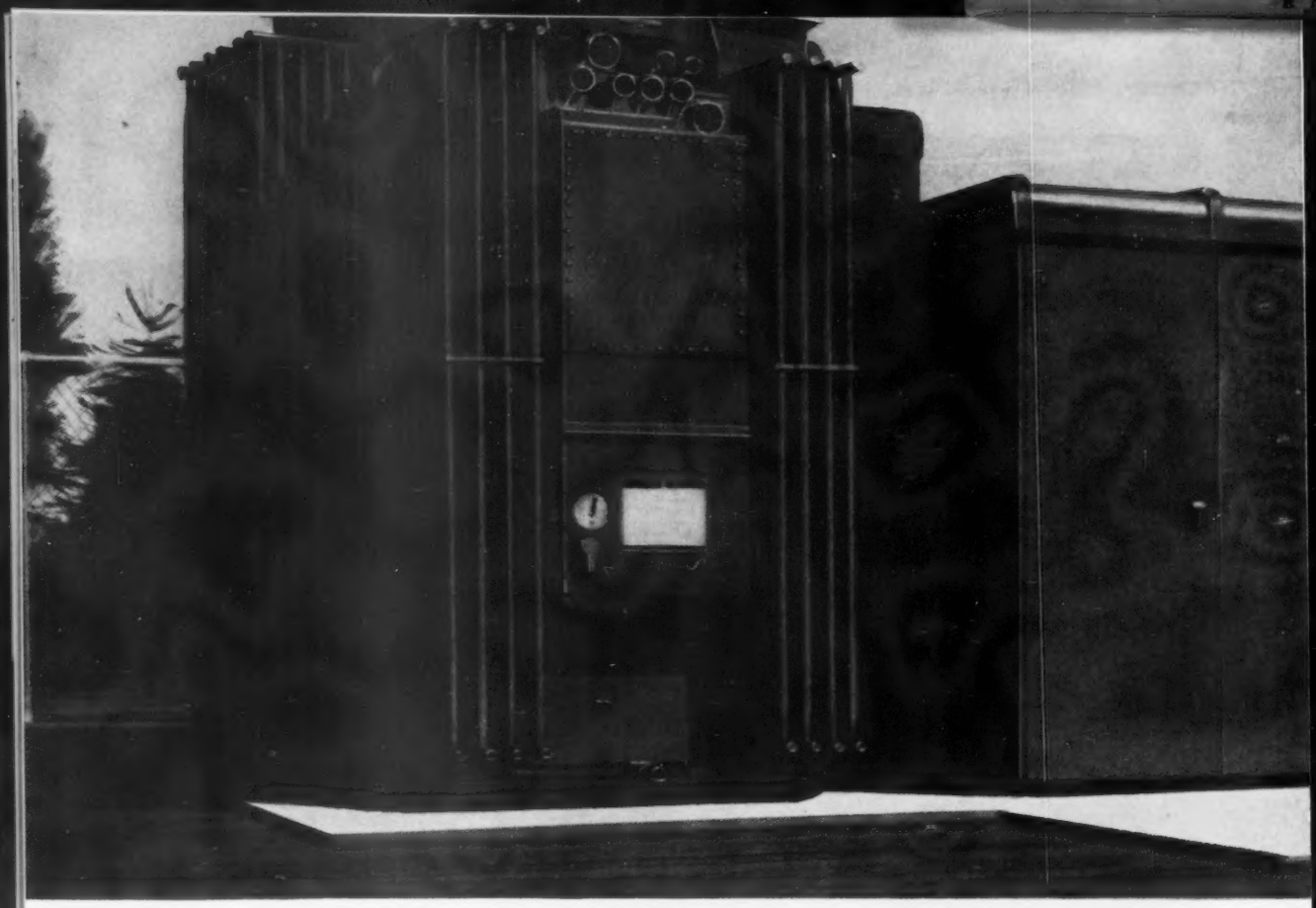
Exit Signs

(11) Albert Sechrist Mfg. Co., P. O. Box 6775, Denver 16, Colo.

Fluorescent lamps are used in this company's new exit signs for longer life, less maintenance and lower operating cost. The UL listed signs are available with green or red backgrounds. Data sheets are offered.



(12) A new system of cooling large power transformers has been announced by Allis-Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee 1, Wis. It makes use of the flexibility possible when two or more large transformers are connected to a common forced oil manifold cooling system. The transformers can be placed in almost any physical relationship to each other to take advantage of the most economical bus or overhead connections. One or more pairs of cooling manifolds run from one transformer to another. They can be mounted between or alongside them. Electro-Coolers are mounted on the manifolds

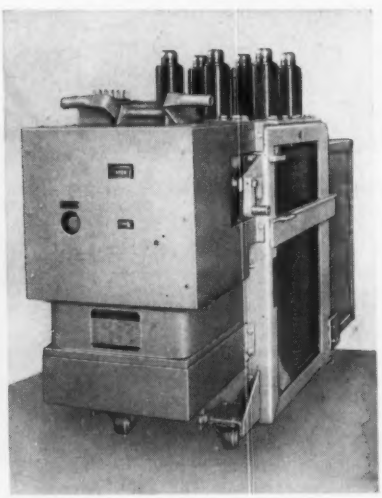


These new features provide . . .

Maximum operating economy with

NEW LOAD TAP CHANGER doubles predictable life of contact tips, cutting routine maintenance in half. Peak operating noise has been reduced by 20 db.

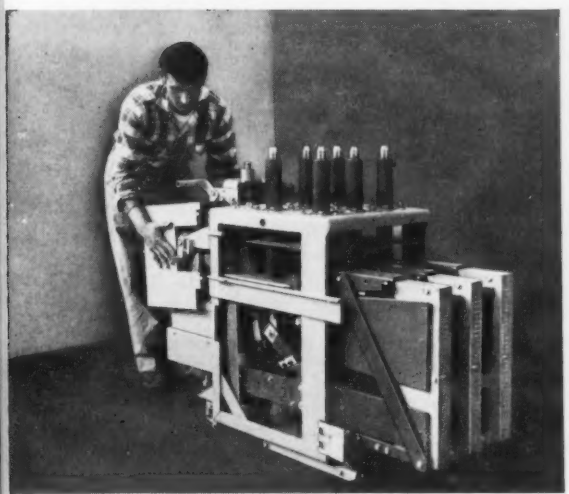
"CONTROL CENTER" groups all transformer indicators and most accessories in single control zone—makes them easier to read and service.



MAGNE-BLAST CIRCUIT BREAKER, now available in ratings up to 750 mva, offers maximum fire protection because of newly improved Self-X insulation.

SMALL SIZE, UNCLUTTERED APPEARANCE MAKES G-E UNIT SUBSTATION EASY TO LANDSCAPE, EASY TO INSTALL CLOSE TO LOAD.

General Electric Unit Substations



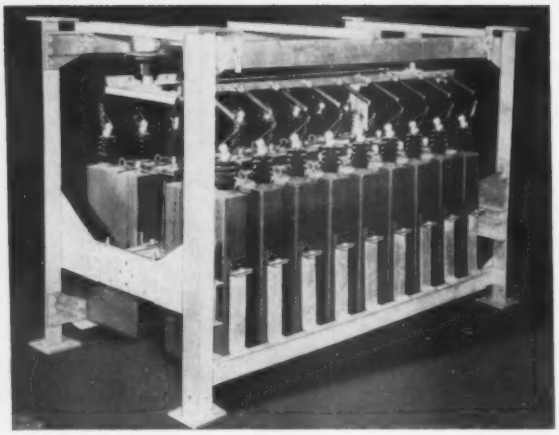
QUICK, EASY ACCESSIBILITY greatly facilitates breaker maintenance. Box barriers and operating mechanism cover can be removed in a minute and a half, completely exposing breaker's vital parts.

The features illustrated on these pages are the most recent quality improvements General Electric has built into its unit substations. They constitute a part of General Electric's continuing effort to provide the users of G-E unit substations with maximum operating performance and a minimum of maintenance. Because of this constant search for a better way, more and more utilities are installing G-E unit substations on their distribution lines as an economical means of handling rapid residential load growth.

For more information about G-E unit substations, contact your G-E Apparatus Sales Office, or write for bulletin GEA-3800, to Section 512-13, General Electric Co., Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC



Capacitor Blocks

(13) Line Material Co., 700 W. Michigan St., Milwaukee 1, Wis.

Factory-assembled capacitor blocks for use with 50-kvar units in open banks are said to reduce equipment costs, decrease field installation charges and save substation space. Bank size and voltage rating are changed more easily, the manufacturer reports. Standard block consists of two rows of capacitor units, 5- or 8.7-kv class.

Clamp Connectors

(14) Burndy Engineering Co. Inc., Norwalk, Conn.

This line of clamp connectors for aluminum or aluminum-to-copper connections is factory-filled with joint compound. A plastic dip holds the compound in the connector grooves until time for installation. The plastic is removed by means of a rip tape that strips the seal. Available for conductors from No. 8 solid copper and aluminum through 300 MCM copper and 336.4 MCM aluminum in the run groove, and No. 8 solid copper and aluminum through No. 2 stranded copper and equivalents in the tap groove.

Cable Puller

(15) Petersen Engineering Co., Santa Clara, Calif.

The cable puller shown is designed for pulling either a steel pulling line or the old conductor used as a pulling line. Can maintain tensions up to 6,000 lb at speed to 4 mph. It pulls in over the double neoprene lined bull wheels and winds the pulling line onto a reel, in the same operation.

Electric Lift

(16) Telsta Corp., 2900 Spring St., Redwood City, Calif.

Design of this mobile electric lift places the basket, on the end of a telescopic boom, alongside driver of the vehicle so it can be entered from within the cab. Operator controls position from basket. It is electrically powered by its own generator independent of the truck system.

Glove Bag

(17) Miller Equipment Co., Inc., 13th & New St., Franklin, Pa.

A new glove bag for protection against water, mildew and fungus is announced by this company. It is made of vinyl-coated nylon, and comes in 16- and 18-in. lengths. Silk screen lettering states: "Always Wear Your Gloves."

Mobile Radiophone

(18) Motorola Inc., Communications & Electronic Division, 4501 W. Augusta Blvd., Chicago 51, Ill.

A mobile two-way radio rated at 100-w transmitter power output on any channel in the 25- to 54-mc frequency band has been announced by this company. Power intake is said to be equivalent to conventional 60-w mobile radios.

Control Switch

(19) Delta-Star Electric Division, H. K. Porter Co., 2437 Fulton St., Chicago 12, Ill.

These multistage switches, available for many uses, are rated 20 amp continuous, 250 amp for three seconds. Features include compact design, large terminal clearances and complete baffling between sections.

Turbine Shaft Load

(20) Baldwin-Lima-Hamilton Corp., 806 Massachusetts Ave., Cambridge 39, Mass.

This company has developed an electrical load measuring system for continuous supervision of thrust loads on the shafts of steam turbines. Thrust is measured by means of resistance wire strain gages incorporated in a special thrust element that is installed as part of Kingsbury bearings. Output is recorded on a Baldwin strip chart recorder. An alarm circuit warns of overloads in either direction of the shaft. First use of the equipment is in automatic supervisory systems for Westinghouse steam turbines.

MIKE THE MOLE SAYS: *Give the GUY a CHANCE*

there's a CHANCE ANCHOR for every guying need

8-WAY EXPANDING

The guy load is distributed all around the anchor—no wasted space between blades. Usually installed in clay or loam.

NEVER-CREEP

Made of structural steel. Pulls *entirely* against solid, undisturbed earth. For extra heavy loads in clay or loam.

NO-WRENCH SCREW

For hand or machine installation. Pitch-controlled blade goes down faster and adds to holding power in sandy soil, soft clay or loam.

CROSS-PLATE

For heavy-duty anchoring in machine-bored holes. Holds better than logs or slugs. Saves time and money.

SWAMP SCREW

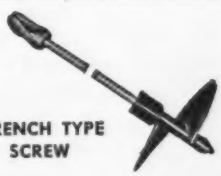
For swamps, marshes, quicksand, river crossings or seasonally flooded areas. Screws down deeply by adding sections of pipe.

8-WAY CONE

Acts as inverted wedge. Flaring base and flat faces increase wedging action. Used in rocky areas with rock wedging.

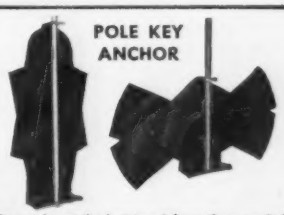
EXPANDING ROCK

No grouting necessary. The greater the pull, the tighter it wedges against solid rock. Set in 2" drilled hole.



WRENCH TYPE SCREW

All steel—double arc welded. Anchor hub absorbs installation strain. For light loads in sandy soil, soft clay or loam.



POLE KEY ANCHOR

Keys poles at the butt to reinforce them against unbalanced loads in soft soil. Ideal for congested urban areas.

Both the soil type and condition are important factors in determining the type of installation and the kind of anchors to use. That's why Chance Anchors are made in so many types and sizes. The anchors shown above are made in a wide variety of sizes. Each type is designed for certain soil and guying conditions. Each of these anchors will do its specific job better than any other anchor you can choose.

Protect your investment in line construction. Analyze your soil and guying conditions, and specify the Chance Anchors that meet your particular requirements.

There is a CHANCE Anchor Distributor in your area who can probably fill your order directly from stock.

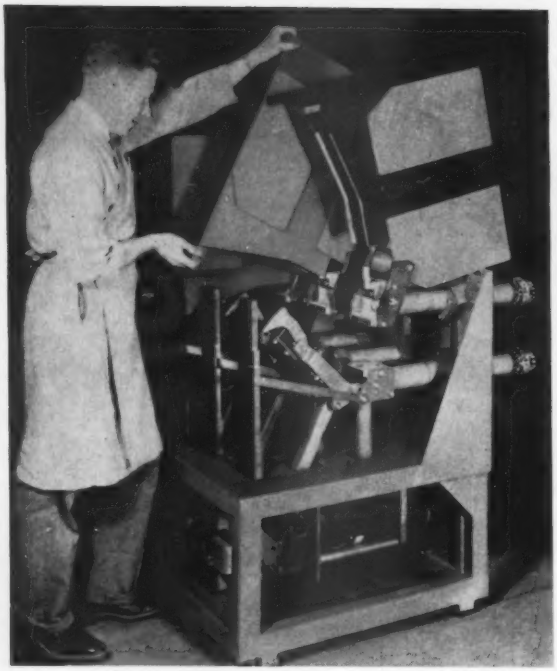
Specify* CHANCE *for Service!

A·B·CHANCE CO·

CENTRALIA, MISSOURI

CA56-19

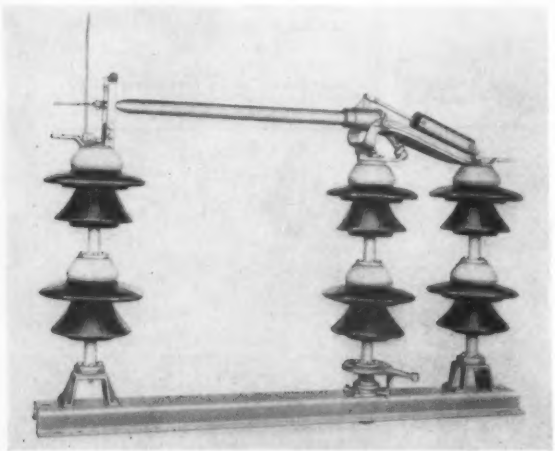
ABC INDUSTRIES



Magnetic Circuit Breakers

(21) Federal Pacific Electric Co., 50 Paris St., Newark 5, N. J.

This manufacturer has added 5- and 15-kv magnetic air circuit breakers to extend the line through 250 and 500 mva interrupting capacity. Other ratings will follow. It is a horizontal drawout device for use in metal-clad switchgear. Chutes can be tilted back for contact inspection.



Air-Break Switch

(22) A. B. Chance Co., 210 N. Allen St., Centralia, Mo.

Permanently lubricated bronze bearings on live parts, a blade-actuating mechanism with three moving parts and a greaseless ball-bearing assembly for rotating insulator are three features of this new air-break switch. It is a vertical break, rotating stack, group operated switch.

Photoelectric Control

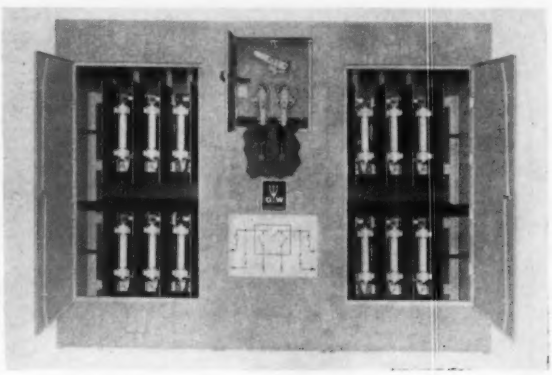
(23) Tuttle & Bailey Division, Allied Thermal Corp., New Britain, Conn.

Sensitive, positive control of any lighting system that should be coordinated with conditions of outdoor light is said to be provided by this sealed cartridge photoelectric lighting control. A design feature is a molded plastic enclosure of the basic unit. It is said to give complete protection against moisture and dirt, and is impervious to climatic changes. In event of failure of a component of the control, the lights controlled are automatically turned on until trouble source is corrected.

Small Ditcher

(24) Charles Machine Works, Perry, Okla.

This small trenching machine is designed for installation of lighting circuits in yards. Ditch is 2 in. wide and 2 to 18 in. deep. Unit weighs 150 lb, and has semipneumatic tires to prevent damage to lawns.



Fuse-Switch Unit

(25) G&W Electric Specialty Co., 7780 Dante Ave., Chicago 19, Ill.

Two feeds and four loads are provided for in this new fuse-switch metal-enclosed unit for high-voltage distribution centers. The 400-amp load-break oil switch has three sets of manually operated links. Can supply two loads from each feeder, or use one feeder for four loads.

Regulator Adjustment

(26) Allis-Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee 1, Wis.

External Vari-Amp adjustment, a feature of this company's single-phase power regulators, is now available for its distribution regulators. Adjustment is made with a screwdriver without removing the regulator from service. It can be placed on regulators already in use.

New FWD Engine

(27) Four Wheel Drive Auto Co., Clintonville, Wis.

FWD is now offering a Deutz V-8 air-cooled diesel engine on 32,000- through 40,000-lb four-wheel-drive units and 36,000- through 40,000-lb six-wheel-drive units. Liquid coolant is replaced with an axial flow blower.

COMPACT NEW PACKAGE...

for BTC Drop-Forged Hi-Line Hardware

- Saves space in warehouses and trucks

- Easier to handle and stack

- Simple identification and inventory

BTC HI-LINE HARDWARE now comes in husky wire-bound wooden boxes. Gone are cumbersome, hard-to-handle bags. These compact boxes stack easily in storage . . . save space in warehouses, on trucks . . . decrease handling costs.

Light enough for one man to handle, the new BTC boxes are clearly labeled to simplify inventory-taking and checking. The label tells the quantity and number of parts inside for fast, easy identification.

Look for these new boxes on your next shipment of BTC Drop-Forged Hi-Line Hardware . . . another reason why it pays to specify BTC Hardware from your insulator manufacturer.

THE BREWER-TITCHENER CORPORATION

Cortland, N. Y.

STOP weeds all season

Just one application of "Telvar" controlled weeds around this fence. Note the type of vegetation involved in untreated area in the foreground.

Spray just once with

Du Pont TELVAR®

WEED KILLERS

When you use "Telvar" weed killers, vegetation is killed through the roots, and regrowth is prevented because the chemical remains in the soil . . . provides residual action all season long. And low dosages (1 to 1½ lbs. per 1,000 sq. ft.) make it cost little for the results you obtain. Such low rates also mean less handling, less use of storage facilities.

"Telvar" weed killers come as wettable powders, are non-corrosive, non-flammable, non-volatile, low in toxicity to humans and livestock.

Include "Telvar" weed killers in your weed-control program this year. Prove to yourself how these products of Du Pont research can help cut your maintenance cost to new low levels.

Where brush is a problem, Du Pont Ammate® X weed and brush killer is the product you need. It kills more kinds of brush with unusual safety. With ordinary precautions, "Ammate" X may be used close to such crops as cotton, tomatoes, soybeans and peanuts.

• • •

FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. Write to Du Pont, Grasselli Chemicals Dept., 111 Sutter Street, San Francisco 4, Calif.

DU PONT REG. U.S. PAT. OFF.

On all chemicals, follow label instructions and warnings carefully.

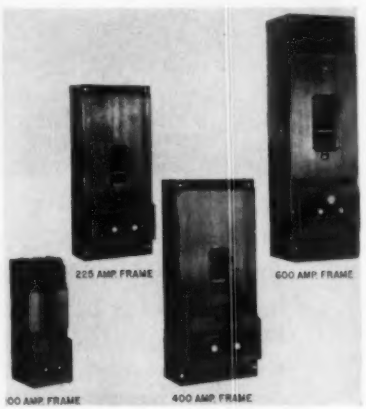
WEED and BRUSH KILLERS

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Elevating Tail Gate

(28) H. S. Watson Co., 1316 67th St., Emeryville 8, Calif.

A lifting capacity of 650 lb is built into this new tail gate loader for pickup trucks. It is hand winch-operated with a completely automatic load brake in operation at all times. Installation is said to take three or four hours, and the device can be reinstalled.



Molded-Case Circuit Breakers

(29) I-T-E Circuit Breaker Co., Small Circuit Breaker Division, 19th & Hamilton St., Philadelphia 30, Pa.

The Cordon line of molded-case breakers, with 100,000-amp interrupting rating, is now being manufactured in frame sizes 100, 225, 400 and 600 amp. The new line is said to provide for the first time a current-limiting device and a standard molded case circuit breaker in the same housing. It also provides a new high for interrupting ratings, according to the manufacturer.

BULLETINS ETC.

(30) DISTRIBUTION CUTOUTS—R&IE Equipment Division, I-T-E Circuit Breaker Co. Inc., Greensburg, Pa., has released a 12-page bulletin containing description, application, dimensions and performance data on its new series C distribution cutouts. Open type, loadbreak and disconnecting cutouts and ordering data are included. Bulletin is 1510A.

(31) PLUGMOLD BASEBOARD—This eight-page circular tells the story of Wiremold's new idea in wiring and rewiring. It shows the wide application of Plugmold in residential, commercial and industrial buildings where multiple electrical outlets and additional circuits are needed. Write for form 590 to The Wiremold Co., Hartford 10, Conn.

(32) GENERAL INFORMATION—General information on policies and products of Electrical Service Co., Box 1039, Greenville, Tex., is contained in a folder now available. The company makes Esco transformers and single-section unit substations. Company is a member of the National Electrical Manufacturers Assn.

(33) CATALOG INSERTIONS—New pages for Anaconda Wire & Cable Co. catalogs are now available. This is Anaconda's first issue of replacement pages to keep the catalogs current with new developments.

(34) REHEAT—The evolution of Allis-Chalmers reheat turbine designs is discussed in a leaflet offered by the company. Write to the company at 939 S. 70th St., Milwaukee, Wis. Ask for 03R8467.

(35) SPLICING KIT—This 12-page booklet contains instructions and application information for the entire line of Scotchcast brand splicing kits. Scotchcast electrical insulating resin No. 4 for pouring field encapsulated splices and three types of splicing kits are described. Write to Minnesota Mining & Mfg. Co., Dept. D6-196, 900 Fauquier St., St. Paul 6, Minn.

(36) ELECTRICAL TOOL STANDARDS—Four hundred cost cutting tools for the electrical industry are described and indexed in the newly-revised edition of "The 400 American Standards in the Electrical Field." Free on request from American Standards Assn., 70 E. 45 St., New York 17, N. Y.

(37) ELECTRIC HEATERS—A revised catalog that describes industrial electrical heating units and devices is available from Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa. Ask for Catalog 27-620.

(38) LOAD CENTER TRANSFORMERS—Engineering data, weights and dimensions on Kuhlman's line of load center transformers are contained in Bulletin CS-1000. Covers features of liquid-filled and dry-type units. Write to Kuhlman Transformer Co., Advertising Department, Bay City, Mich.

(39) AERIAL CABLE—A new booklet on aerial cable for electric utility and industrial power distribution systems is announced by General Electric's Wire & Cable Department. Write to the G-E Construction Materials Division, Bridgeport 2, Conn.

(40) EMPLOYMENT CONDITIONS — Copies of the report by Engineers Joint Council entitled "Professional Standards and Employment Conditions" are available from Engineers Joint Council, 29 W. 39th St., New York 18, N. Y.

KILL TWO BIRDS WITH ONE STONE—Fill out this coupon and get back valuable information from as many sources as you indicate.

ELECTRICAL WEST
68 Post St., San Francisco 4, Calif.

Not good after December 1

Please send me, without obligation, the new product information or catalogs:

If described in Product News, circle item number

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

If described in advertising, fill in page number

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

NAME..... TITLE.....

COMPANY.....

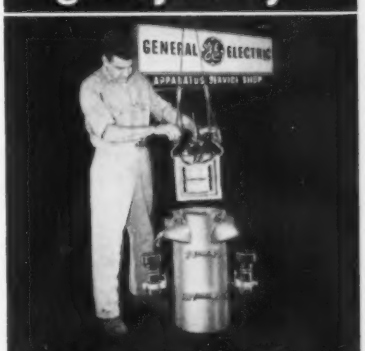
ADDRESS.....

CITY..... ZONE..... STATE.....

*Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

Rescued from

graveyard by



G-E Service Shop

Get your obsolete distribution transformers back on the pole again—as good as new! Just call your local G-E Service Shop. We'll rebuild them ...uprate them 40% or more ...and return them with new-transformer warranties. There are 52 G-E Service Shops throughout the country—one near you. 431-31

Progress Is Our Most Important Product

GENERAL ELECTRIC

17 Years of continuous service

prove Kuhlman Porcelain Enamel Transformers give positive protection against salt spray and corrosion

Utilities have used Kuhlman Porcelain Enamel Transformers since 1938. They report no deterioration in the enamel finish after 17 years of continuous service.

These units, serving in areas of heavy salt spray and industrial corrosion, have proven that Kuhlman porcelain enamel is far superior to ordinary finishes which corrosive atmospheres destroy in a short time. In every reported case, Kuhlman's exclusive finish is saving maintenance and repainting costs—shows no signs of rusting, cracking, or fading under the most severe conditions.

It is no wonder that Kuhlman porcelain enamel resists corrosion. Unlike paint, it is permanently fused to the tank metal at 1500° F forming a glass coating three times the thickness of ordinary paint. The resulting rock-hard surface makes an attractive, durable transformer finish—guaranteed to give you long life corrosion-free service.

For more facts about Kuhlman porcelain enamel transformers, write or ask for bulletin PB-140.

YOU GET THIS POSITIVE PROTECTION:

- Non-Corrosive external hardware
- Well protected support lugs
- Protected seams, welds, and bushing openings
- Heavy coating on the bottom of the tank

KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

DISTRIBUTED BY MAYDWELL & HARTZELL, INC. Seattle • Spokane • Portland • San Francisco • Los Angeles • San Diego • Phoenix

ELECTRICAL WEST SALES GUIDE © OCTOBER 1956

News Letter

FOR THE ELECTRICAL MERCHANT OF THE WEST

For men only

Because women at cooking and appliance shows are forever saying, "My husband should have been here," Western Colorado Power Co. decided to get him there. It tried out a series of cooking classes for men and boys only. Results were gratifying (see p 115, this issue). Question and answer periods brought good response. The men knew the mechanics of the equipment but were interested in getting the "housewife" viewpoint. One frankly admitted that he helped his working wife plan meals and would like more information on "fancying up" brown-and-serve rolls. Another was glad to know that, with a freezer, leftovers fed to the dog or thrown away at his house could be saved and used by the family.

Electri-Living homes

Arizona's Electri-Living home will be opened at Scottsdale on Oct. 14. One of 23 homes being built throughout the nation under sponsorship of *Young Homemakers* magazine and local utilities, it was designed to show the public what electric living can do for them. Each home is expected to express the way the individual community believes its people want to live. Sponsored by Salt River Power District, the three-bedroom Scottsdale home has a heat pump, all-electric kitchen with built-ins, high-fidelity audio system controlled from the family room, remote control switch in the master bedroom for all lighting. These Electri-Living homes (for details of one at Portland, see p 112) are approved by NHBA.

NECA's Selectric home

Approximately 2,000 people inspected NECA's Selectric home at Spokane on the day it was opened for public inspection—and many of them said they were going back for another look. The home (see p 112) was sponsored by 41 member contractors of the Inland Empire Chapter, NECA, to show the public that it can afford modern electrical conveniences and to renew contractor interest in residential wiring. To get a true cost picture, bids were called for construction and wiring, and appliances were bought at retail. The home will be put up for sale at about $30,000 after the public viewing. It was financed with a conventional 75% construction loan, with cash reserve provided from the NECA treasury. If response to this first Selectric home warrants, others may be built in the Inland Empire area.

Nothing to chance

Sponsors of all-electric model homes are not leaving it to chance that people who inspect them will pick out the electrical features. They are giving them attractive, illustrated brochures to use as they go through the homes and to take away with them. NECA furnished a keyed diagram with its Selectric home. Sixty-seven numbers in the diagram were explained briefly in the text. In the house itself features were clearly marked with the numerals so that visitors could refer to the brochure for quick information on the electrical equipment and its use.

Want to rewire

A City Light program at Tacoma, Wash., to help homeowners rewire their homes for electric ranges and water heaters brought almost 500 responses in three months, the Tacoma Public Utilities Board has been informed by T. Ivan Usher, City Light community relations manager. The first three months of the drive saw 124 homes changing to electric water heaters, 247 converting from sidearm to automatic water heaters and the installation of 128 new ranges. City Light pays $50 toward rewiring costs where a flame-type or sidearm water heater and a flame-type kitchen range are replaced with automatic electrical appliances.

Boise parade

A carnival effect pervades at the Parade of Homes opened in Boise on Sept. 22. Street booths, banners, flags, backed up by completely furnished homes and landscaped yards give plenty of eye appeal. Snake River Valley Electrical Assn. is sponsoring an all-electric home in the parade to show how a properly wired home and modern electric appliances can make for better living. So that the adults can look at their leisure, youngsters are cared for on the grounds.

Light up for winter

With winter just around the corner, distributors and Idaho Power are cooperating in the SRVEA-sponsored Light Bulb campaign. The program, which began Sept. 11, features strong dealer tie-in with free "Bag-O-Bulb" bags, display cards, advertising and free coupons that customers redeem as one-half the purchase price on a Beauty-Plus table lamp.

Story in few words

Utah Power & Light has a clever skit based on a parody of *16 Tons.* Only two girls and one man are required to tell the story. When the curtain rises, the first girl, in house dress, is busy drying "tons" of washing while the man, one of the dealer consultants, holds the clothes line and sings the words. Second girl, dressed for a party, enters from the other side of the stage, throws her clothes in the washer-dryer and exits. Man drops clothes line; follows her out.

Industry displays

Industry-wide displays of electrical products in the Construction Industries Center to be built in Los Angeles were proposed recently by President Quinton of Southern California Edison Co. An industry coordinating committee to consider these centralized displays is chairmanned by W. E. Cranston, president of Thermador Mfg. Co.

To whet appetites

A stepped-up program to increase residential load was announced by the Los Angeles Department of Water & Power at a dinner meeting on Sept. 12. The appliance market potential in the Los Angeles area is fabulous, W. F. Lovelace, residential sales manager, pointed out, and electric rates are very favorable. The department program is designed to sharpen the housewife's appetite, he said.

Getting results

In an aggressive campaign to get more electric ranges and water heaters on its lines, Sacramento Municipal Utility District reports good progress. Second-quarter sales of ranges totaled 1,838 as compared with 1,261 for the same period in 1955. Electric water heater sales for the quarter totaled 581 as compared with 126 a year ago.

Budget for space heating

B. C. Electric has introduced a budget billing plan for residential electric space heating that is expected to help sell this service. The company will estimate cost of electricity used for heating and other uses, covering the 10 months from September through June. The estimate will be divided into 10 equal payments based upon anticipated requirements during the average heating season and including typical consumption for other appliances and lighting. Any difference between the cost of electricity used and the amount paid under the budget billing plan will be adjusted on the July service bill. The plan will be reviewed periodically to see if revisions in budget payments should be made. Either the company or the customer may discontinue the plan.

Plastic model helps sell

Betty Buettner, G-E home economist in this area, has designed a plastic model G-E dishwasher and Utah Power & Light reports that it is using it successfully. Company home economists load it up with dishes and utensils for a complete dinner for four; tell their story and demonstrate features while they unload it. A large table is required to hold all the items taken out of the dishwasher and UP&L home economists report increased interest in dishwashers since they have had the mobile demonstration unit.

Fair kitchens

Pacific Gas and Electric Co. sponsored a display of eight model kitchens at the California State Fair in Sacramento. Idea rooms showed the newest equipment; emphasized built-ins and color. This utility spotlighted the second TV set in mid-September advertising. Lighting equipment sales also were boosted in September ads that took a "Bright-Minded" theme.

Heads committee

Marguerite Fenner, PG and E home economics director, has been made general chairman of the California Home Economics Assn. convention and exhibition committee, in charge of the exhibition to be held in San Francisco in April 1957.

Herb Names, Denver distributor, is one of four Sylvania distributors in the nation to receive a certificate of merit for outstanding efficiency in television service. The award was made in Buffalo, N. Y., by M. E. Pettegrew, Sylvania vice-president.

Wins award

National TV Week, Sept. 23-29, was celebrated throughout the West. NARDA President Don Gabbert was principal speaker at banquets in Phoenix and Bakersfield. The Phoenix meeting was sponsored by AMA, with Russell J. Morrissey of Mehagian's as chairman . . . At Bakersfield George Noonan was chairman and Bakersfield Radio & Appliance Dealers Assn. combined the program with its Annual Salesman's Appreciation dinner . . . In Los Angeles Glen Logan, local chairman, arranged for Leo Durocher to address a luncheon at the Conrad Hilton Hotel on Sept. 27. For its drive, the Electric League of Los Angeles produced 3,000 window banners with the theme "Fabulous TV Fall," stressing programs from the nominations to the election . . . Seattle held its big National TV event on Sept. 27, with Fred Ogilby, Philco vice-president, as speaker. The meeting was in conjunction with the NATA Profit Clinic, chairmanned by Tom Carmichael. James Rench, Sherman Clay, was TV Week chairman for the area . . . San Diego Bureau of Home Appliances included TV Week in its annual Fall Conference program, with Marty Bennett, RCA-Victor, speaking on television. The promotion will be continued through November and was launched Sept. 23 by Bureau President Ed Nystrom on the Weatherword program. Theme of the campaign is "See What You're Missing" . . . At Salt Lake City, IEA was sponsor, Robert O. Trottier, chairman. Main speaker was Al Robertson . . . In Tucson, chairman was Bruce F. Hannah; TAMA was sponsor. TAMA's "It's Time to Buy TV" city-wide promotion will continue through Oct. 15.

TV week celebrated in West

District Judge Robert W. Reidy has upheld the constitutionality of New Mexico's fair trade law, opening the way for a final determination of the question in the State Supreme Court. Validity of the 1937 fair trade act was challenged by Skaggs Drug Store, Albuquerque, defendant in a price violation suit filed by General Electric Co. and Miles Laboratories Inc. The two companies charged that Skaggs had sold their brand-name merchandise in violation of manufacturers' agreements and contrary to the state fair trade law. Skaggs contended the law was a "price-fixing scheme in restraint of trade." The drug firm attacked the nonsigner provisions of the law, which hold that retailers must sell fair-traded items at stipulated prices though they have not signed agreements with the manufacturers. The suit—first test of the 19-year-old fair trade act—was first filed in U. S. District Court in Albuquerque, but at the suggestion of U. S. District Judge Carl A. Hatch was transferred to the state district court in the same city. In his decision, Judge Reidy ruled that although the trend of recent decisions in other states is against the constitutionality of fair trade acts, New Mexico's law "is not patently unconstitutional in view of the diversity of opinion throughout other state supreme court decisions."

Fair Trade upheld in New Mexico

Undergoing tests at the Westinghouse plant in Columbus is an add-on refrigerator-freezer unit. Cabinets that can be hung on the wall or placed under the counter provide from 5 to 25 cu ft of capacity and serve cold water, ice cubes or crushed ice. In modular sizes the cabinets are cooled by a forced air system. Temperature in individual cabinets can be controlled to make them refrigerators or freezers. Air is forced from the compressor cabinet through ducts into each of the food storage cabinets located at convenient places in the kitchen. Access to some cabinets can be from the living room, if desired. One big advantage of the units is the fact that a couple can start with a compressor unit and a 5-ft cabinet; add on as needs expand. Thermo-Struct, a new plastic material that can be cut to any size or shape, is being used for the units.

Add-on refrigerator

Sentinel Radio Co., a subsidiary of Magnavox, has announced a new line that includes 14 TV sets, five Hi-Fi phonograph and radio-phonograph combinations, a six-transistor pocket radio and a group of other portable table and clock radios. The TV line includes five portables, 14 and 17 in.

New line

A dispenser wheel, operating on a principle of centrifugal force, distributes detergent and water conditioners in the new Norge automatic washers. It is loaded with material—holds it until spinning reaches certain speed. The companion dryer has a Hamper-Dor to aid with loading and unloading.

Washer feature

New items

Tappen is offering a 36-in. electric range that is completely automatic; has a 17-in. chrome-lined oven with visualite oven window and lift-off door, a second 14-in. "bonus" oven, both with high-speed broilers . . . **Trilmont Products Co.** has introduced a new line of portable electric room heaters. The de luxe model has an economy thermal control adjustable to three heat levels and claimed to cut current consumption 50% in winter, 75% in spring and fall . . . **Berko** has perfected a 2,000-w glass radiant heating unit claimed to have a greater concentration of wattage per square inch. It is one model in the manufacture's new High Heat Output series.

Names in the news

Names in the news include **J. B. Chadwell,** who is new general manager of the Hoffman Sales Division of Los Angeles . . . **Roland H. Martin** is district manager of Norge home appliance sales in Billings, Portland, Seattle and Spokane . . . **Cal Callicott** has rejoined Sues, Young & Brown as a territory manager of the Zenith division . . . **Bartley C. Furey** and **Mitchell M. Werwa** are new district managers of Hotpoint's television receiver department in San Francisco and Los Angeles, respectively. Both are new positions . . . **Dean W. Phillips** is the new Western division regional sales manager for Sentinel Radio Co., with an office in Hollywood . . . **Kenneth C. Kleidon** has the new position of national color television manager for Hycon Electronics . . . **Bert Engleman** has joined the staff of Wosk's Ltd. in Vancouver, B. C., to sell appliances.

Moved

Paul H. Rice Co., representing Preway, Zero Freez, Fowler and Eagle, has moved to Box 157, San Bruno, Calif., from its San Francisco Market Street address.

Distributor news

Tel-Electric Distributors Inc., Spokane, has been appointed distributor of Norge home appliances in parts of Montana, Idaho and Washington . . . New or refranchised distributors of Sentinel products in the West are: **James J. Kerwin Co.,** Los Angeles; **R. D. Schwalb Co.,** San Francisco; **United Electronic Wholesale Co.,** Twin Falls; and **Seattle Radio Supply Inc.,** Seattle . . . **Electrical & Mechanical Supply's** Albuquerque branch now has a distributor franchise for Republic Steel Kitchens . . . **Home Electric Co.,** Tacoma, is now a distributor of Westinghouse portable appliances. Address is 2212 A St. . . **California Electric Supply Co.,** San Francisco, has been named a distributor of the Ben-Hur Mfg. Co., according to E. F. Jackson, vice-president and sales manager of the home freezer manufacturer.

In the utilities

Chuck Ekstrom has been named marketing consultant for Arizona Public Service Co. in a move to promote gas and electric appliances on a system-wide basis. He will work with district and divisional sales personnel on promotions, and in maintaining contact with distributors, architects, contractors and others . . . **Darcie H. White** is new assistant business development manager for Utah Power & Light Co. He has an electrical engineering background.

Leaves West

Dan Dougherty leaves the West to assume the position of special field representative for Norge. He has been district sales manager in Montana, Oregon and Washington for the past two years.

Salesmen meet

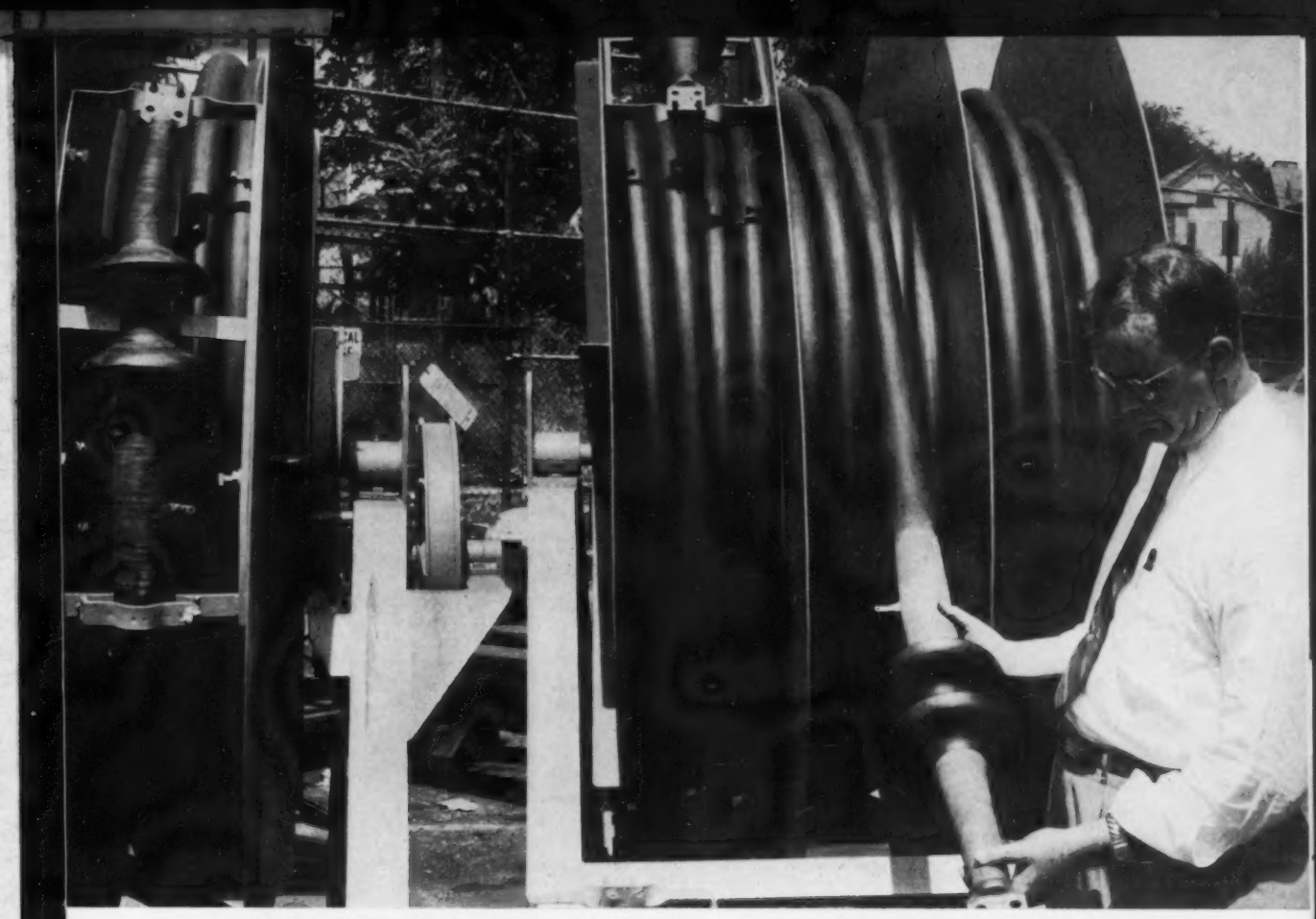
Merchandising meetings for Chrysler Airtemp dealers, distributors and area salespeople will reach the West in October. At Phoenix, the meeting will be at the Westward Ho Hotel Oct. 15. The Los Angeles meeting is at the Huntington Hotel Oct. 17. The San Francisco meeting is at the Villa Hotel Oct. 22.

Going up

Signs of the times might include airplanes flying higher—and appliance prices climbing higher. Hotpoint Co. has announced varying price increases on all products . . . Emerson has raised the price on six TV receivers to give a $10 higher retail, and forecasts more of a hike soon . . . Motorola reports more of the same, with most TV sets $10 to $20 higher . . . Waste King has raised the price to jobbers and dealers 1% on household garbage disposers.

Promotions big

People on the sales firing line must be getting some comfort from the promotional ideas and budgets of various manufacturers. For example, Whirlpool-Seeger has announced that the 1957 promotion budget for major appliances is more than $20,000,000 . . . Emerson is scheduling the largest promotion program in the company's history, which will cost "in excess of $8,000,000" . . . Motorola is doing a "Back to School" campaign in major consumer magazines . . . Hoffman also announced "the most extensive sales promotion campaign" in its history, with three 1957 Buicks waiting for enterprising distributors . . . Hotpoint has nominated Hotpoint for election to consumer homes in a sales campaign with—you guessed it—a take-off on elections as its theme.



Okonite's portable substation cable showing factory-made terminations (bracket on specially designed reel holds one on left, while engineer examines another at right). Color coded terminations include vulcanized stress relief cones and insulators, ground straps and terminal lugs. They are ready for immediate use.

for substation emergencies or maintenance... use Okonite portable cable

Okonite portable substation cable has two important utility applications:

Emergency service—Cable is used to quickly connect mobile substations into existing lines when regular substation is out of operation. This reduces amount of service loss to consumers.

Maintenance—Portable substation equipped with Okonite cable maintains service to power users while substation is de-energized and serviced.

Advantages of Okonite portable substation cable:

Primary and secondary cables are available with heavy reinforced Okoprene sheath which provides extended service life. Sheath withstands mechanical strain caused by repeated winding, unwinding and dragging over the ground. Moreover, the extra flexible conductor and shielding braid provide easy handling under all weather conditions.

Cables are supplied in specified lengths with factory-made terminations at each end. (Type and style of terminal lug is specified by customer.) With these complete, factory-made terminations, the cable is ready for immediate service and can be connected in a matter of minutes.

Okonite cable can be supplied on specially designed steel reels, with conventional or bifilar wind (the latter enables cable to be unwound in opposite directions simultaneously). They can be immediately mounted on assigned truck and are provided with manual driving gear and brake for let-off and take-up.

For complete information about Okonite portable substation cable, write to The Okonite Company, Passaic, New Jersey.

available with copper or aluminum conductors

OKONITE PASSAIC, N.J.

OKONITE OKONITE SINCE 1878 ***insulated cables***

3889

ELECTRA'S HUSBAND

THE round table at the club got in over its head the other day when one of the regulars remarked:

"I'm really beginning to get scared over this Atomic Age."

"Who isn't," I replied. "Ever since Electra read about the minimum permissive dosage of radiation she's been trying to figure out how much she has had. Of course, that's impossible and it infuriates her that she can't come up with some sort of an answer."

"You're talking over my head. I must have missed some of these new aspects," said another of the group. "Just what is this all about?"

"Our friend here brought up the subject, let him tell you." This was my way of ducking out of an explanation about which I wasn't too well informed either.

"Well, that's not exactly what I had in mind when I made my statement," replied the first speaker. "However, it seems that the Rockefeller Foundation has financed some studies which indicate that the safe exposure of any individual to radioactivity is a very low figure, not much more than the cumulative effect of natural atmospheric bombardment plus the X-rays that most modern people have to have as a medical necessity. There's a lot of medical gobbledygook involved but it all boils down to the fact that exposure above a certain limited amount of radiation definitely can cause harmful mutations that might well affect the future of the race. In fact, the British experts contend that even the maximum permissible exposure should not be permitted to apply to more than 1/50th of the total population of the country. Over here it is recommended that records be kept for every individual showing his total lifetime accumulation of exposure to radiation."

"Yes, Electra read that too," I injected. "She says it will require more paper work than the Quartermaster Corps."

"I don't see that it makes much difference," chimed in another of the men. "If we have an atomic war a lot of us are going to get overirradiated and there isn't much we can do about it."

It Never Gets Better

"It's not only war that I was thinking about," replied the first speaker. "Even in the peacetime application of the atom I believe we have a bigger bear by the tail than we ever realized. Everyone is working like crazy to harness atomic energy for the benefit of mankind. Right now it looks as though that means putting it to work through the electrical arteries of the country. Once they get it working, they are going to dump a lot of problems right back into the lap of the utility industry and say, 'Here, it's your baby and your responsibility.' Two of the biggest

"Hot Subject"

headaches are going to be safety to personnel and the disposal of the fission products. Everyone is worried about the cost of power and the cost of insurance. I maintain that it's going to be a costly process to control the exposure of operating personnel to keep it at a safe level, such as we were just talking about, and even more costly to handle and get rid of the spent fuel elements which still have an extremely high rate of radioactivity."

"If what you say is true," I said, "the problem of smoke emission from a thermal plant is going to look like mighty small potatoes."

"I'll say it is," agreed our expert. "The products of atomic combustion are a hundred times more difficult to cope with. They're deadly, and their decay, unlike other waste products of civilization, is measured in centuries rather than days."

"But aren't these waste products going to be rather small in volume?" asked another of the luncheon group. "I was under the impression that the charge for an atomic station was measured in a relatively few pounds of fissionable material."

"That's true. But again you must remember that there is a cumulative effect. The waste disposal problem never gets better, it always gets worse volumetrically. A committee that has been studying it estimates that by 1965 U. S. reactors will be producing somewhat more than 20 lb of fissionable end products per day (equivalent in radioactivity to tens of tons of radium). By 1980 the accumulated solutions of waste may amount to 200,000,000 gal but by the year 2000 these same "hot" solutions would go up to 2.4 billion gal and that's only for the United States.

"These same solutions have to be contained in special vessels that will endure literally for centuries and they have to be stored or disposed of in some place where they can't contaminate the products which might be used by this or future generations."

One of the more optimistic members of the group suggested: "Maybe they'll find ways of reprocessing these products so that the real waste won't be dangerous."

"Of course, they are working on it," said the first speaker, "but they are a long way from an answer. And as long as you are working with irradiated materials and as long as the human tolerances are as low as they are, you are going to have some real problems to cope with.

"If you go out and bury these wastes in some of the unoccupied areas of the country today, how do you know that some project in the far-distant future won't rip them up and release their deadly effects? If you dump them in the ocean, you are liable to start a chain reaction on marine life that could deprive millions and millions of people of their main source of diet. You can't just release them in the air to be dissipated because already the radioactive fall-out is causing concern. Maybe now you see why I said that we might have a bear by the tail."

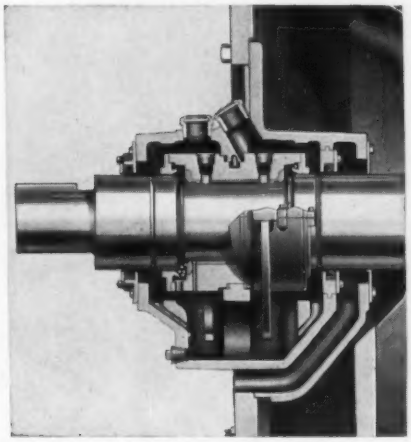
International Headache

"You make it sound most ominous." I think I expressed the sentiment of the group. "It looks like every country in the world is going to have these same problems and it looks as though some sort of a strict international control is going to be necessary if the planet is to remain habitable for any great length of time. With the world in the state that it is today, I'd hate to think that we'd have to rely on some of the international conferences we've seen so far to prevent some other country from dumping its waste fission products into our own back yard."

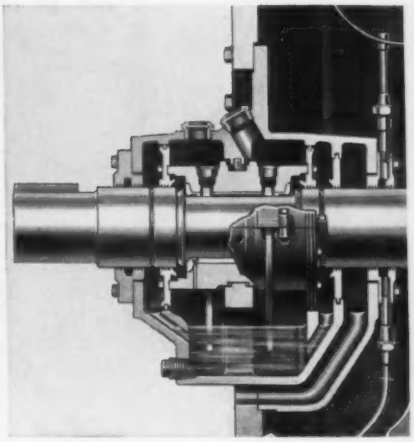
"I'm beginning to be sorry I brought the subject up. Unlocking the atom was about the same as lifting the lid on Pandora's box. It's either going to tear the world apart with an atomic war or it's going to bring the human race closer together so that we all can learn to live with growing colonies of gamma rays and beta particles."

NEW Bearing Design Means Better Motor Performance

Allis-Chalmers capsule-type sleeve bearings now perfected for complete motor line



Standard capsule-type sleeve bearing



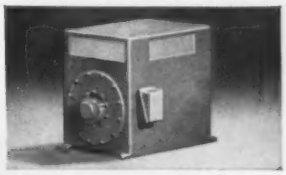
High speed capsule-type sleeve bearing

A new feature—an improved capsule-type bearing design—has been added to the Allis-Chalmers complete line of large end-shield bearing motors. This new bearing will give you better motor service, simplified maintenance and longer motor life through features like:

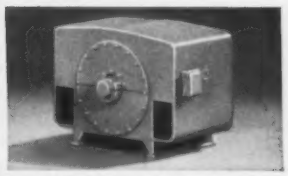
- Dust-tight, leakproof enclosure protects bearing from dirt, dust or abrasive materials.
- Venting system prevents oil leakage — keeps oil and vapor from getting into motor enclosure.
- Dual oil-rings insure bearing surface lubrication — either ring can adequately lubricate bearing.
- Split end-shield gives easy accessibility to winding and air gap — without disturbing capsule or bearing alignment.

Drip-proof or splash-proof cage motor

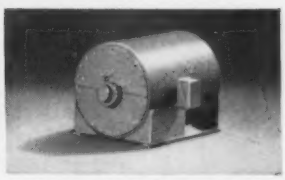
Synchronous or wound-rotor motor



High speed cage motor

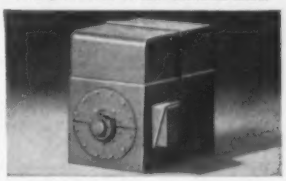


Weather-protected motor



Totally-enclosed fan-cooled motor

Totally-enclosed forced-ventilated motor



Water-cooled or inert-gas-filled motor

Capsule-type bearings are standard on these Allis-Chalmers motors.

You get MORE from Allis-Chalmers motors

More design and construction features — more application help. For complete information, contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

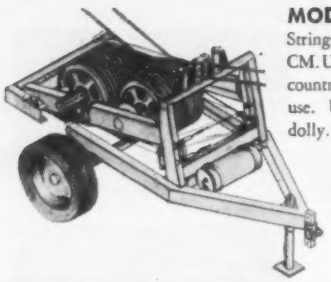
ALLIS-CHALMERS

A-5032

Partial showing of the now ***COMPLETE*** line of . . .

PENGO TENSION WIRE STRINGING EQUIPMENT

Manufactured By PETERSEN ENGINEERING CO., Santa Clara, Calif.

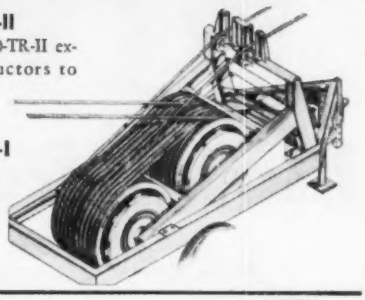


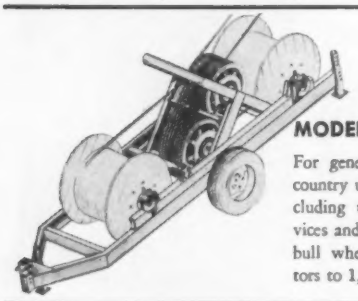
MODEL 5000-TR-II
Strings two conductors to 556,300 CM. Used primarily for very rough country work; also for general use. Use separate reel-carrying dolly.

MODEL 5000-TR-I
Similar except strings one conductor.

MODEL 6000-TR-II
Similar to Model 5000-TR-II except larger. Conductors to 1,272,000 CM.

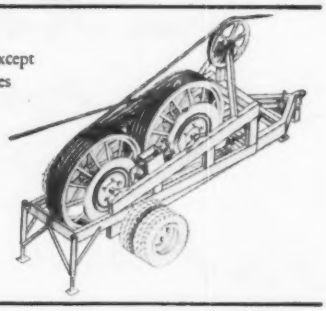
MODEL 6000-TR-I
Similar except for one conductor.

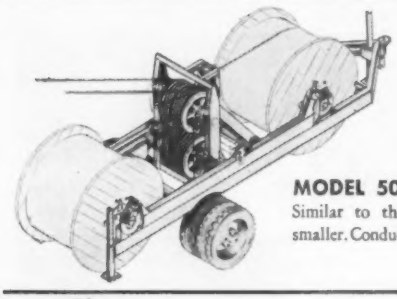




MODEL 6000-WS-TR
For general and medium rough country use. A complete unit including trailer, reel-carrying devices and its own double pair of bull wheels. Conductors to 1,272,000 CM.

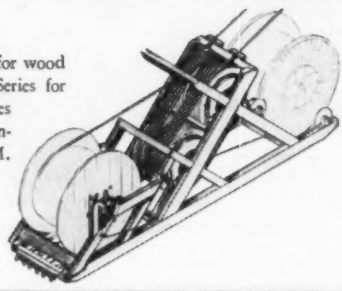
MODEL 7000-TR-I
Similar to model 6000-TR-I except larger. Conductors to 2 inches diameter.

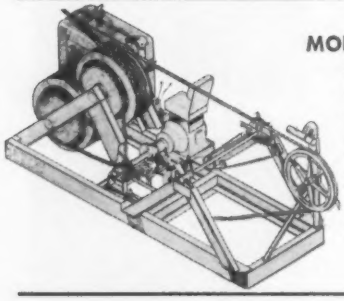




MODEL 5000-WS-TR
Similar to the 6000-WS-TR but smaller. Conductors to 556,300 CM.

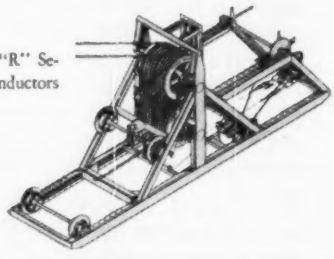
MODEL 6000-W
Available in "S" Series for wood or steel reels, in "R" Series for steel reels, or "SR" Series for trailer mounting. Conductors to 1,272,000 CM.

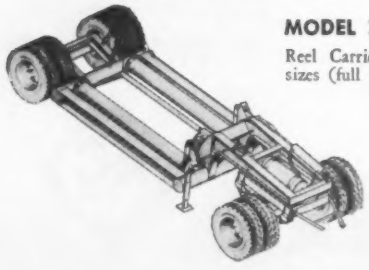




MODEL 6500
Bull Wheel Cable Puller. Available in "R" Series for steel reels, "S" Series for wood reels. Conductors to 1,272,000 CM. Also available in "LWR" Model for extra-large steel reels. Model 5500 similar (smaller).

MODEL 5000-SR
Available in "S" Series, "R" Series, or "SR" Series. Conductors to 556,300 CM.





MODEL 7500
Reel Carrier. Takes the largest sizes (full range) of steel reels. Loads and unloads with one man. No auxiliary equipment needed except the truck that pulls it. For use with any one of the tensioning machines shown on this page.

ADDITIONAL MODELS NOT SHOWN

Tension Reel Trailers

MODELS 2, 3, and 4, Two-Wheel Straddle Dollies not shown. For use with any one of the tensioning machines shown on these pages.

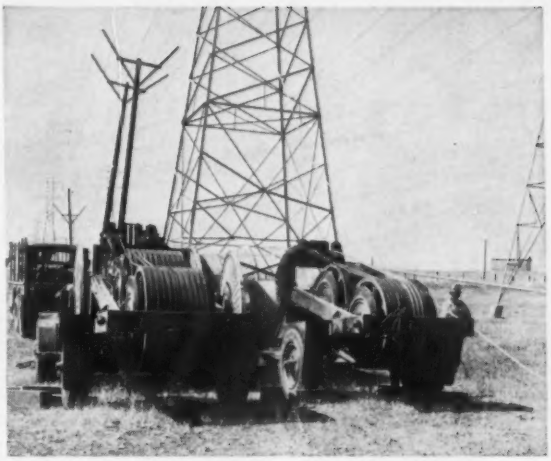
Tension Stringers

MODELS 6000-SK-I and 6000-SK-II For one or two conductors to 1,272,000 CM. Skid mounted for installation on owner's equipment.

MODELS 5000-SK-I and 5000-SK-II Skid mounted for installing on owner's equipment. For stringing one or two conductors to 556,300 CM.

MODEL 5000-WS-III Strings three conductors to 556,300 CM. For mounting on low-bed or full trailer.

MODEL 6000-WS-III Strings three conductors to 1,272,000 CM. For mounting on low-bed or full trailer.



Two PENGO model 6000 TR-II wire tensioners being used by Pacific Gas and Electric Co. in reconductoring job between Vacaville, Calif. and Cottonwood, Calif. 285 miles of 500 MCM copper is being replaced by 954 MCM aluminum in this operation.

Newest method of stringing overhead lines

Two PENGO model 6500 Bullwheel Cable Pullers used by Pacific Gas and Electric Co. for pulling in the new line on the job mentioned above. Unit, manned by an operator and one reel tender, pulls the pulling line (in this instance the old copper conductor) over the double neoprene lined Bullwheels and winds it for shipment in a single operation.

- ***Safest, most economical way of stringing transmission, distribution and even secondary lines.***
- ***Its greatest savings are effected when stringing over and through energized circuits . . . by far the safest, too!***

Smooth, postive control of conductor tension can be maintained at all times regardless of model or size of PENGO tensioning equipment used. The large, specially designed PENGO disc brakes are mounted away from the Bullwheels to assure dissipation of the heat generated by the continuous braking action and prevent transmission of the heat to the Bullwheels.

Note the wide range of models on the opposite page available for all types of jobs or terrain and for all sizes of conductor.

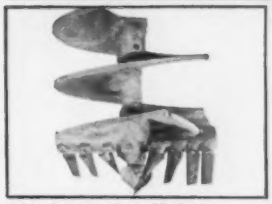
List your requirements and send for descriptive literature and prices.

Made by the makers of the World-Famous
PENGO EARTH AUGERS

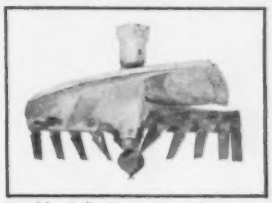
PETERSEN
ENGINEERING COMPANY
Santa Clara, Calif.

PETERSEN ENGINEERING CO.
Santa Clara, California **Dept. 3**
Please send me more information on the new Pengo wire stringing equipment.
Name_____
Firm_____
Address_____
City_____ State_____

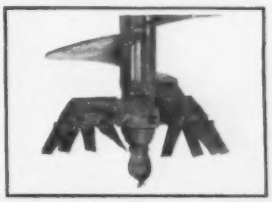
Other PENGO Products include:



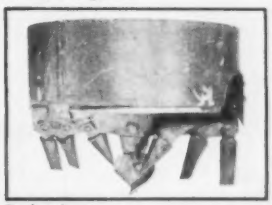
24 inch Heavy Duty Flight Auger



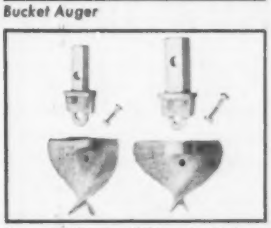
Double-Helix Heavy Duty Auger



Offset Boring Head

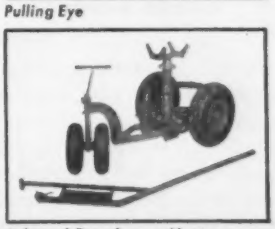


Bucket Auger



Screw Bit for Small Diameter Holes

Pulling Eye



Pole and Transformer Chariot

NEW COMPUTER makes possible solution of complex turbine-generator engineering problems which were unsolvable employing earlier calculating methods. Here, shown in General Electric's Large Steam Turbine-Generator Engineering Calculations Center, H. N. Cantrell, A. W. Rankin and Ruth E. Callaghan examine turbine bucket "program" results computed by the new IBM 704.

Use of new computer makes possible . . .

New horizons in turbine-generator design

Installation of the first IBM 704 computer for exclusively non-defense private industry use is speeding major advances in turbine-generator design and construction. The new computer, now in full-time operation at General Electric's Large Steam Turbine-Generator Department in Schenectady, is one of the most advanced computers currently available for engineering and scientific calculations.

VARIED APPLICATIONS

The new computer permits the solution of complex engineering problems otherwise unsolvable by previous methods. Some of the problems presently being processed include new design calculations of low-pressure turbine components; bucket and turbine rotor vibration frequencies; and generator electrical and ventilation designs. In addition, it will soon be used to obtain turbine cycle heat balances and heat rates, thus making this type of data available in a much shorter period of time than is currently possible.

Extensive use of the new 704, with its ability to make a larger number of calculations in solving problems, is helping engineers to achieve optimum turbine-generator design more readily, thus engineers and designers have more time for creative thinking and the development of new designs.

PROMISES SIGNIFICANT DESIGN SOLUTIONS

This application of the 704 computer marks a significant contribution to the development of larger turbine-generators which will offer even greater efficiencies to help electric utilities economically meet spiralling load growth. And, other advanced types of computation devices are at work throughout General Electric, helping to speed refinements in G.E.'s full range of apparatus for the electric utility industry. For further details, contact your nearest General Electric Apparatus Sales Representative. General Electric Company, Schenectady 5, N. Y.

LIVE BETTER ELECTRICALLY

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GENERAL ELECTRIC

ELECTRICAL WEST SPOKESMAN FOR MOST HIGHLY ELECTRIFIED REGION OF THE U. S. VOL. 117 NO. 4 OCTOBER 1956

Accident prevention studies and strictly enforced safety programs become increasingly important as inflation, booming construction and more liberal court decisions tend to spur . . .

The Mounting Cost of Accidents

Raymond W. White, Chairman, EEI Accident Prevention Committee*

Accidents cost dearly in terms of suffering, hardships and out-of-pocket money cost for the victim and the company.

There has been an encouraging improvement in the concern and interest which the industry's executives and supervisory personnel are taking in the prevention of accidents. However, the results being obtained, although gratifying, leave the industry far from the position which it should rightfully occupy in this field.

For example, the electric utility, which showed a remarkable improvement in safety from 1949 to 1955, still is well below the average of 40 of the major U. S. industries in both frequency and severity rates. Even such hazardous industries as shipbuilding and chemicals have a much better record. (See chart.) The real purpose of this discussion is to appraise for management some economic, rather than humanitarian, aspects of intensified safety programs.

Of course executive participation alone is not a panacea that will stop all accidents, but no accident prevention program can succeed without it.

Management's function is to provide the proper climate for accident prevention. Obviously, active participation of all employees and especially the supervisory employees is essential to the success of an accident prevention program.

Accident injuries and death are unpleasant things to contemplate and in addition to the personal suffering and grief that they bring about they are, to be brutally frank, costly propositions to any company. They are costing the industry millions of dollars each year and they are costing employees additional millions by way of reduced earning power and expenses not covered by compensation payments. These are red-ink entries clear across the books.

Fundamentally, accident reduction serves the cause of humanity. That in itself is gratifying and satisfying. But added dividends lie in the advancement of the company's stature among employees and the public and the enhancement of its sound financial position.

Realistically, the practical business executive is astute enough to realize that failure to reduce accidents will force someone else to step in and enforce safe working procedures in a manner that may be irritating and costly.

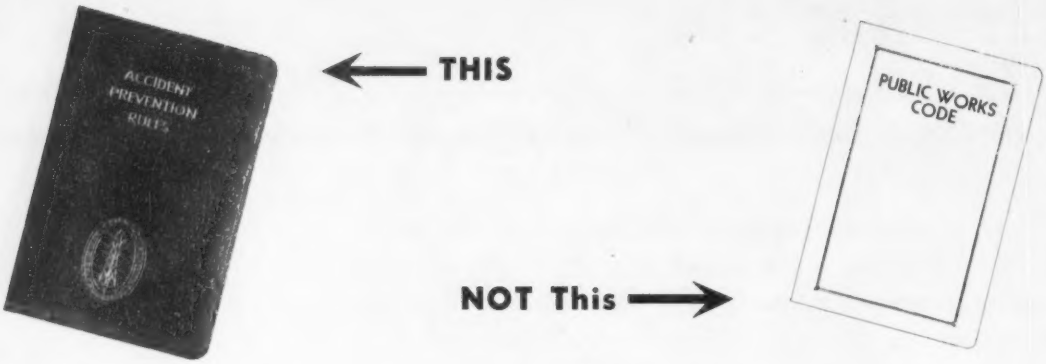
Inflation, recent legal decisions regarding corporate responsibility, and more liberal claim settlements promise to make accidents much more costly in the future. Conversely, the higher price of accidents makes the economics of accident prevention training programs and supervision much more attractive.

1955 injury rates, reporters to National Safety Council

Hidden Costs High

These latter functions are nonrevenue-producing activities. One of the first questions that enters the mind of an executive is the cost and the

* Mr. White is manager of the claims and safety department, Pacific Gas and Electric Co.



benefits and savings to be derived therefrom. In respect to the cost of accidents, medical and settlement costs are obvious direct costs. But, like the visible portion of an iceberg, direct cost represents only a small portion of the subsurface indirect expense. Studies made by H. W. Heinrich many years ago, which are still considered the guide in such matters, indicate that, for every $1 of direct costs, there are (on the average) $4 of indirect costs. For example, in one case involving permanent injuries to four people where direct settlement costs were $185,000, the indirect or hidden costs would be $740,000. Therefore, the total costs could be assessed at $925,000 for the one single accident. And that particular accident could have been prevented with just a little extra thought or training.

Indirect costs include but are not limited to: (1) investigations (time of top supervisors, claims investigators, photographs, etc.); (2) expert's fees; (3) attorney's fees; (4) employee morale; (5) work stoppage—production loss; (6) adverse legislation and punitive regulations; (7) increase in insurance costs; (8) adverse public relations and lack of public confidence.

The first five indirect costs are self-explanatory and are those most commonly thought of when discussing the indirect costs of accidents. The remaining three, although often ignored, can result in some appreciable, and permanent, additions to company operating expenses.

Experience has indicated that an almost certain aftermath of accidents is the enactment of retaliatory or punitive legislation designed to accomplish a reduction in such accidents and, generally, these go much further than is necessary—to the extent of seriously hampering an industry's activities, causing additional expense and slowing up of work. California, for example, now has what amounts almost to a whole bookshelf of state laws and safety regulations of governmental agencies, such as the Division of Industrial Safety, Public Utilities Commission, etc. In addition, the cities and counties are active in this field. Many of these regulations are desirable, but all of them have been brought about by accidents in industry that industry was apparently unable to prevent by itself. Some of the regulations are extremely restrictive and of questionable effectiveness. Nevertheless, when passed, they must be complied with at considerable expense and it becomes most difficult for anyone other than a lawyer to interpret these. Even the lawyers are in considerable doubt at times because of the ambiguities of the language.

Persons who are well intentioned but unfamiliar with, or unskilled in, the problems of accident prevention often cause considerable difficulties in forcing legislation through without consultation with the industry involved. A rather ridiculous example of this is the statute that was passed in a midwestern state following a series of grade-crossing accidents. The statute read as follows: "When two trains approach at a grade crossing, they shall both come to a full stop and neither shall start up until the other has gone."

Obviously, this safety statute defeated its own objective and so do many safety restrictions being proposed today—but the point is that they probably would not be proposed in the first place unless prior accidents had harmed or alarmed others.

Certainly the enactment of reasonable safety regulations by government agencies or the insistence by labor unions that they be complied with is wholly understandable. But is it not far better to regulate ourselves so as to make outside regulation in this field unnecessary? Why risk the untenable position of complaining of restrictive regulations if accidents that risk the lives and property of the public, our employees and even our very existence continue?

State safety orders are a direct reminder that industry as a whole has failed to keep far enough ahead in safeguarding its employees and the public and that orders were necessary to compel a proper standard of safety. It is possible to alleviate the necessity for many such orders in the future by making and enforcing sound and reasonable safety regulations as required by new techniques and accident statistics.

The insurance industry has become an important factor in all of our lives today and almost every industry has had to protect itself by insuring against accident liabilities and especially against large losses. Even the big companies in industry carry excess insurance coverage so that they will not be financially embarrassed by catastrophic losses. This prevents sudden inroads on working capital and on other assets and gives a freedom for expansion and operations that would be difficult if huge reserves had to be kept intact to take care of accident liability contingencies. Likewise, this protection helps keep down the "cost of money" when a company must seek new capital.

The following discussion cited by the author in a talk to the Pacific Coast Gas Assn. happens to involve the gas utility industry (with which the author is also associated) but is illustrative of insurance problems that can result from accidents.

A series of events in the gas industry has brought about an expensive and precarious condition in the availability of casualty insurance coverage to the gas industry. One of these events is an accident that occurred in the suburbs of Rochester, N. Y., on Sept. 21, 1951. Leaking gas in a manhole vault exploded, resulting in the blocking of certain district regulators in an open position; thus excessive pressure from the 30-lb main line was permitted to enter a large number of residences in an exclusive area. Gas meters were broken, pilot lights blown out, and explosions and fires in the residences followed with startling rapidity. Within 1½ hours, 19 homes were destroyed, 25 others badly damaged, and minor damage was done to many other dwellings. Two chil-

← THIS

At right, a line foreman holds a tail-board conference, giving last-minute safety instruction to his crew

Below, too late for accident prevention. Whatever the cause, accidents exact heavy toll in personal suffering, lost time and corporate costs

NOT This ↓

dren were killed and 30 persons were injured. Approximately 775 claims were processed at a cost in excess of $1,000,000.

Not only did this case and others like it bring a rash of governmental investigations and proposed restrictive safety regulations for public safety but they also were a major factor in the decision of the American casualty companies to refrain from carrying excess liability insurance on the gas utility companies' operations. For a period most of this type of coverage afforded the gas industry had to come from other than American companies, and premiums were higher and restrictive wording of policies more common.

In discussing this subject at that time, one insurance company executive pointed to the failure of premiums to pay for losses plus a reasonable rate of return for the insurance companies was the basic reason for the departure of the American casualty companies from this market. In citing some of the practices that investigation indicated had brought about this condition, he listed: failure to test new lines before putting them into operation, failure to maintain a regular inspection program; failure to protect mains endangered by operations of other contractors; failure to repair known defects; and failure to protect mains endangered by earth movements. Such activities cost money but the inability to secure adequate excess liability insurance coverage is an extremely precarious financial situation, too. The gas industry went to work and corrected the situation, employing broad preventive methods. As a result of this improvement, American insurance companies are again showing interest in writing liability insurance for the gas utility companies.

Similar problems have arisen in the electric industry and in other industries from time to time.

A utility is known by the everyday conduct and service of its employees and by the policies of its management. If this relationship is well handled, there is good public relations. A utility that has many accidents cannot have good public relations, regardless of how good the rest of its activities are, because accidents cause pain and suffering and financial loss and because accidents tend to destroy the confidence of not only those directly affected but of the entire community. A feeling of uneasiness and concern is engendered and it is difficult to secure respect and trust for the utility that has brought this condition about.

The thousands of dollars our industry spends in advertising and in seeking good public relations can be offset by the occurrence of a few unfortunate accidents resulting from our operations. In the words of an old proverb: "An hour may destroy what an age was building." On the other hand, a good accident record can be an instrumentality of securing the respect and confidence of the public, particularly if the story of how it is secured can be properly told through advertisements and otherwise.

By showing concern and accomplishments in the humanitarian field of accident prevention, business can go a long way toward defeating the arguments of its detractors, who decry alleged "soullessness" and falsely contend that it is only concerned over profits. This is real public relations of the kind that pays off and stands the test of time.

It is paradoxical that those in the industry whose primary responsibility is that of safety and accident prevention have to "sell" safety—continuously. Employees must be sold on using procedures that will prevent death and injury. Supervisory employees must be sold on keeping the safety torch burning continuously; the families of the employees and the general public must be sold time-after-time that the company is bending every effort to avert accidents. Finally, management itself must be sold, and kept sold, on the idea that the price of safety is less than the cost of accidents—that dollars invested in the humanitarian effort to avert tragedy and suffering are like the bread cast upon the water—returning many-fold. With today's mounting costs, this fact is more than ever deserving of management's consideration.

Fig. 1—Careful preparation, minute attention to detail and meticulous planning were the basic ingredients of B. C. Electric's success in connecting the mainland with Vancouver Island by means of a record-breaking submarine cable circuit. Here (left to right) are Joe Peck, staff engineer; Jack Steede, chief engineer; and Tom Ingledow, vice-president and general manager of B. C. Electric, checking readings along the route with the chief hydrographer

British Columbia Electric Co. connects Vancouver Island and the mainland with record-breaking 120,000-kva . . .

138-Kv Submarine Cable Link

Another engineering "first" can be added to the long list of Western engineering achievements. Late last month the British Columbia Electric Co. completed a 46-mile transmission circuit connecting the mainland with Vancouver Island. The $8,000,000 project incorporates the following features of unusual engineering interest:

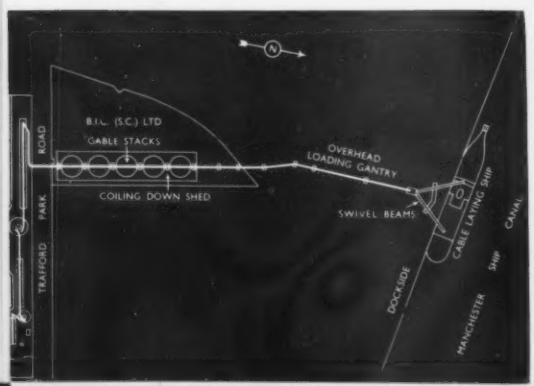
—One portion of the circuit includes a 16½-mile, 138-kv submarine crossing consisting of five single-conductor cables of continuous length. *This makes it the world's largest capacity, highest voltage and longest unspliced submarine power cable ever laid.*

—The cable operates under 300-psi nitrogen pressure.

—The fabrication, transportation and laying operations include use of the most modern of marine and electronic devices available in the world today.

—The new circuit makes available the hydroelectric resources of the mainland to Vancouver Island where low cost energy sources are very limited

Fig. 2—Below, the 138-kv cable was manufactured in England in continuous lengths, the longest of which was 16½ miles. As reels could not be used for transport, the cable was taken directly from the factory to a storage shed near the dock where it was coiled in 10 separate lengths as shown at the right. When the cable-laying ship was brought alongside, the cable was again transported by means of an overhead loading gantry and was stored in the four holds of the vessel



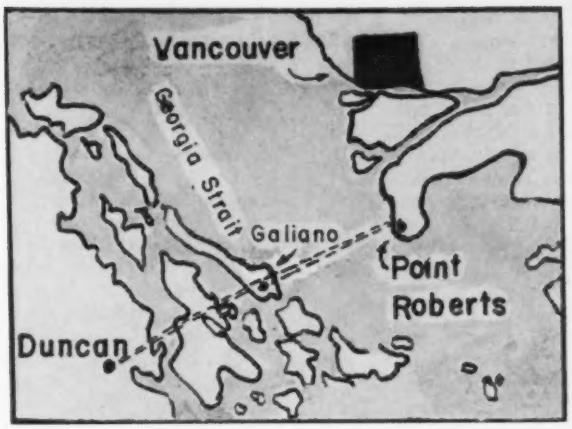


Fig. 3—Map showing the approximate route of the 46-mile transmission circuit consisting of two submarine, two overhead links

and where substantial electrical growth is being experienced.

For these reasons this project is one of the most significant electrical developments in recent years and has been watched with interest by engineers from all over the world.

The route of the transmission circuit includes two undersea and two overhead links. The first link consists of the 16½-mile submarine cable crossing from the British mainland south of Vancouver across the Straits of Georgia to Galiano Island. An overhead circuit from this terminal carries it across the island to the easternmost terminus of a second 3½-mile submarine cable link under Trincomali Channel to Salt Spring Island. From that cable terminal the line is carried overhead across Salt Spring Island and to Vancouver Island where it terminates near Duncan and connects with the Victoria-Nanaimo transmission network on southern Vancouver Island.

Laying Operations

The laying operations really began with the original concept of the job which specified that the undersea cable circuits were to be furnished in continuous lengths to avoid underwater splices. The cable contractor, British Insulated Callenders Cables Ltd., fabricated the cable in continuous lengths at its facilities near Manchester, England. As the cable was completed, it was transported from the factory direct to a dockside coiling shed where each length was coiled and stored to await transportation. Upon completion of manufacture, the modern cable ship *Ocean Layer* was chartered and the cable moved into her four cable tanks by means of an overhead gantry with two swivel beams. In all, nearly 100 miles of cable in ten lengths, five for

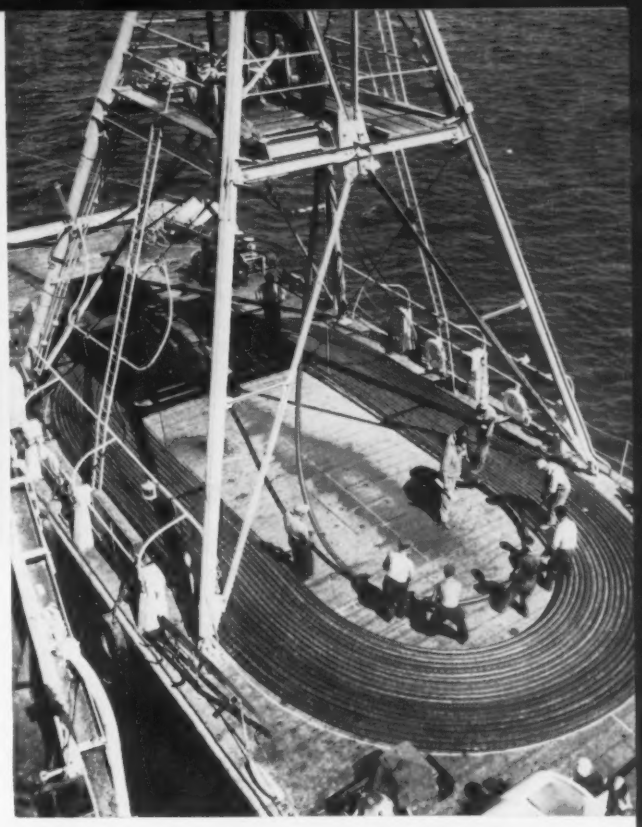


Fig. 4—The shore end of one of the cables being uncoiled on a barge alongside the cable-laying ship. In all these operations great care was exercised to avoid twisting the cable — a difficult task when cable of this size and length is being handled

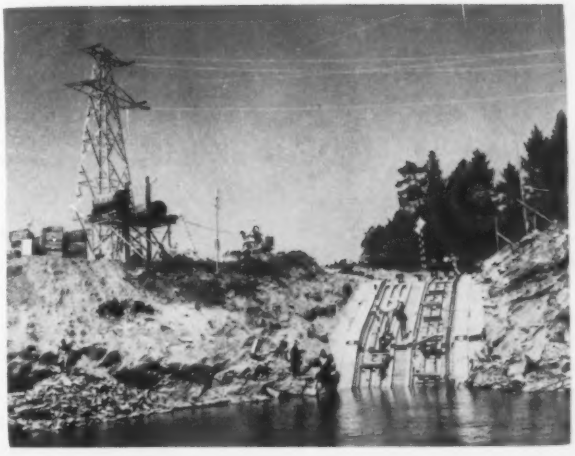


Fig. 5—A view of the anchor chase on the mainland terminal of the cable. Cable was taken from the barge shown above and pulled through the 400-ft cable tunnel (shown below right) to the terminal of the overhead line, which will feed electric power into the new circuit. The cable, as it emerges from the sea over the anchor chases, will be carried on racks along the wall of the cable tunnel

the 16½-mile crossing across Georgia Straits and five for the 3½-mile crossing across Trincomali Channel were loaded and transported to Vancouver via the Panama Canal.

At the beginning of the installation procedure, each cable was uncoiled on a barge for a sufficient length to reach the shore terminal point. In all of these operations great care had to be exercised to prevent the cables from twisting or kinking. To facilitate this the cable was manufactured with an indicating line on the outer sheath so that any tendency to twist or roll could be corrected immediately as the cable was being transported and laid.

The cable was brought ashore to the terminals over specially prepared anchor chases (see Fig. 5). On the mainland end, a 400-ft reinforced concrete tunnel connects the anchor chase with the overhead line terminal site. The cable is carried on brackets along the tunnel walls to the terminals after emerging from the sea.

Once the shore end had been secured, actual cable laying operations got under way. Extensive oceanic surveys during the past two years had determined the exact route the ship was to follow. The *Ocean Layer* itself not only was equipped with all of the latest electronic navigation devices but likewise is the first British ship to be equipped with a Pleuger active rudder. This device consists of a auxiliary propeller housed in the pear-shaped rudder blade which tremendously increases a vessel's maneuverability—an essential feature in cable-laying operations.

Temporary radio towers were erected at each end of the crossing and these same stations transmitted radio signals which were picked up on special indicating instruments at the navigation desk of the ship. These instruments were calibrated to correspond with numbers marked along the predetermined course of the ship so that the exact course desired could be obtained by making the numbers on the instruments correspond with the numbers along the chartered course.

Cable was paid out at a ship speed of approximately 3½ knots, each of the five runs across the Georgia Straits channel taking about five hours. Maximum depth along the route was approximately 600 ft.

Cable Description

Each cable consists of a hollow copper core insulated with impregnated paper and covered by a lead jacket. Surmounting the lead jacket are three thin layers of a tinned bronze tape which in turn is covered by a rubber jacket. Outside the rubber jacket are galvanized stranded steel cables to protect against abrasion and damage. The entire cable is then encased in a waterproof jute wrapping. Over-all diameter is 4½ in.

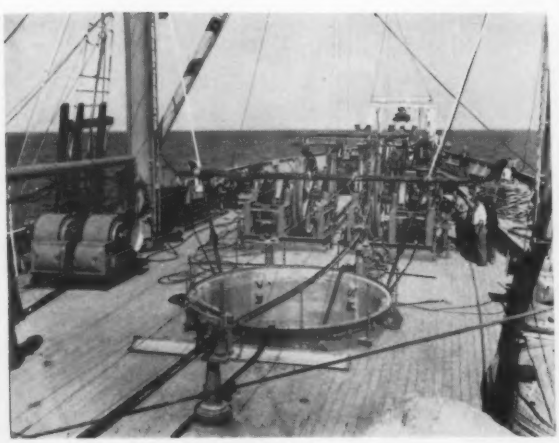
Alarm System

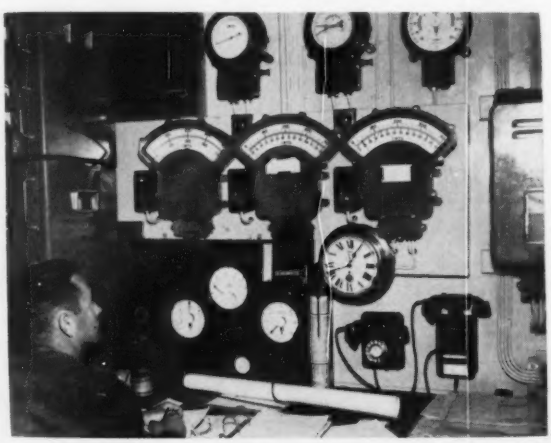
Nitrogen gas under 300 psi was introduced through pressure into the portion of the cable enclosed in the lead sheath. Emergency pumping equipment at gas pressure stations at each terminal starts automatically when pressure dips below 300 psi inside the cable and sufficient pressure will be maintained on the cable until repair crews can be dispatched. An alarm system has been devised in cooperation with the B. C. Telephone Co. to warn of a drop in gas pressure or in the event of leakage or damage. The drop in pressure is indicated by a light on the telephone exchange nearest the trouble zone.

Although similar alarm systems have been devised in the past, this is believed to be the first time that such an alarm system has been adapted by engineers to high-pressure, gas-filled power cables.

A 120,000 kva capacity for Vancouver Island can be augmented if and when the load growth there makes such a move economically feasible. Of the five cables now laid across the strait, four are active and one a spare, but eventually there probably will be seven in service.

Fig. 5 (left)—A British sailor on the cable ship is shown holding a cross section of the cable. Each cable is a hollow core, single conductor, paper insulated, lead covered unit with the lead covering protected by a rubber jacket, armored wire and a jute wrapping. Nitrogen pressure at 300 psi is introduced into the lead sheath. Operating at 138 kv, this cable is the highest voltage undersea cable in the world . . . Fig. 6 (below left)—A view of the deck of the cable ship Ocean Layer showing the cable being paid out from the hold over 7-ft-diameter sheaves . . . Fig. 7 (below right)—Special electronic equipment at the navigator's desk aboard the cable ship, operating in conjunction with radio signals beamed from temporary terminal stations on the shore, made precise navigation possible





Shaw Butte repeater station, 10 miles north of Phoenix, serves as an important junction point of the microwave system. At mountain-top locations, the microwave equipment is housed in sheet-metal fabricated buildings that are constructed in the company's machine shops. Parabolic-type reflectors on building beam microwave signals along the various legs of APSCO's extensive system

In booming Arizona, Arizona Public Service Co. finds . . .

Microwave System Meets Tests

T. A. Phillips

Vice-president in Charge of Engineering
Arizona Public Service Co.

S. Lapenson

Commercial Electronics Products
Radio Corp. of America

Arizona Public Service Co.'s microwave system forms the backbone of an elaborate communications operation encompassing 40,000 square miles of service area that includes 10 of the state's 14 counties and 60% of its population. It has proved to be not only dependable (reliability in the high nineties) but highly flexible as well. During the dynamic Arizona growth decade from 1945 to 1955, the company's microwave facilities, which had started as a small three-station system in the Phoenix area, mushroomed into a 27-station system, embracing an area from the Mexican border on the south, to the Grand Canyon and Indian country in the north, and east from the Petrified Forest to the Colorado River on the west.

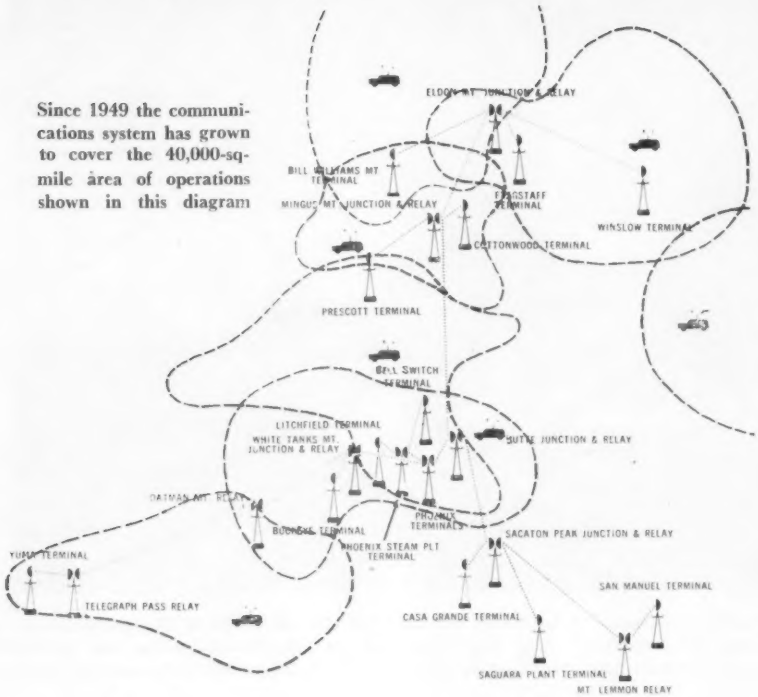
When growth dictated the need for an integrated communications system, the company's engineering department undertook a careful study to determine the operational and economic advantages of various communications methods. Results of the study, which considered the company's specific requirements, weighed heavily in favor of microwave. Economic factors, for example, favored microwave by a wide margin. But lower cost was not felt to be the only asset. Microwave's excellent characteristics from the standpoint of noise and distortion, ability to combine with mobile communications, reliability, relative ease of maintenance, and the availability of a wide spectrum to support expansion were carefully considered.

Carrier Versus Microwave

Where a multiplicity of communications channels are required, microwave was found to offer a practical method of adding or dropping channels in large numbers once a link is established. Also, even though the company already has existing wire strung between supervisory units, the nature of the company's system would have required a considerable number of two-frequency line traps, plus expensive coupling capacitors and line terminating units for its high-tension lines. Results of these studies led the company to install its first three-station microwave system in 1949 between Phoenix, Litchfield and Bell Switch. This system met exacting demands for dependability and performance. An additional system was, therefore, added in 1953 from Phoenix to Winslow. This leg covered 210 miles and provided additional VHF control channels as well as voice channels. The following year, another leg of approximately 150 miles was added from Phoenix to Saguara. Then, in 1955 a 175-mile addition took the system from Phoenix to Yuma.

More than 225 mobile vehicles equipped with two-way radio help to extend the range of the microwave system so that, in effect, today the company's radio facilities adequately cover the vast 40,000-square-mile service area.

Microwaves, like light beams, may be focused in narrow beams. Parabolic reflectors, which serve as receiving and transmitting antennas, bounce



Since 1949 the communications system has grown to cover the 40,000-sq-mile area of operations shown in this diagram

the beam from one point to another, spanning distances normally on the order of 30 miles between stations. In Arizona's system, favorable mountain-top terrain made it possible to span more than 70 miles on single hops between stations.

Description of System

Phoenix serves as an important pivot point in the company's operations and is, therefore, an important terminal and junction point of the microwave system. Communications from all parts of the state converge in the Phoenix area. Incoming microwave traffic is routed from the penthouse radio room on top of the company's administration building to the various departments concerned with operations, construction, service and administration.

On a map, the over-all microwave system takes the form of a huge inverted Y with Phoenix at the fork. Phoenix is situated in a valley and looks out toward formidable mountains on the north and west. The microwave system makes advantageous use of local terrain. A microwave station on top of nearby White Tank Mountain, aligned directly down on the terminal in Phoenix, relays the signals on its Western Division. Another station on Shaw Butte Mountain relays the signals from both the Northern and Southern Divisions of the system down to Phoenix by a short 10-mile hop. The advantageous use of mountain locations throughout the system has made possible such long distance hops as one of 77.5 miles between Shaw Butte and Mingus, and another of 73.3 miles between Oatman Mountain and Telegraph Pass.

On the northern leg of the Y, a combination of VHF, conference and dial channels from Winslow combines with telemetering channels plus additional voice circuits at Mount Elden. From here, the signals are relayed to another junction at Mingus Mountain where additional channels are picked up from Cottonwood and Prescott and relayed on to Phoenix. One basic eight-channel multiplex group carries most of the traffic.

On the western leg, voice and supervisory and telemetering channels are relayed from Yuma to White Tanks. En route, VHF channels are inserted at Telegraph Pass, Oatman Mountain, and White Tanks. At the latter station, six additional telemetering and supervisory channels as well as voice channel are added to the system.

On the southern leg, which extends from Phoenix to San Manuel, Sacaton Pass serves as an important junction with Casa Grande and the company's Saguara plant. The entire leg is operated through a "B" translator, which stacks channels in the 5-8 kc to 32.8-kc range at approximately 4-kc intervals. At Sacaton, a 53.46-mc VHF link is dropped while eight narrow-band channels carry supervisory and telemetering data from the Saguara and Casa Grande plants back to Phoenix. One narrow-band channel is provided from supervisory control.

R. J. McKnight, supervisor of protection and communications, uses headset to contact outlying stations. RCA CW-20 microwave equipment is in the rack at the right

Supervisory Control Functions

Supervisory control equipment operated over the microwave link performs selections, controls operations, and transmits indications by means of separate codes. At the Phoenix and Prescott installations are switchboard units that provide individual lamps and key groups for each supervised unit, plus a set of "common" operating lamps and keys, and supervisory relays.

New Efficiency in Operations

In the APSCO communications system, microwave together with two-way radio are effectively combined to bridge vast distances of Arizona in split seconds. To provide better service for its customers, the communications system provides separate channels for many different types of functions. The basic type of facilities which the system provides are:

1. A dispatching party line linking all points in the system, including dispatch points, compressor stations and four terminal offices.
2. An operational party line for general operational traffic connecting field offices, maintenance centers, steam plants and substations.
3. An operational private line for maximum availability of communications between any two stations in the system.
4. A VHF radio control circuit that enables persons at fixed locations to talk with employees in any of 225 VHF equipped vehicles.
5. Telemetering channels that trans-

Occupying the entire wall of the load dispatching room is a system one-line diagram that shows circuit breaker indications in red and green lights. Microwave system provides methods of protection, operation and communication for the dispatchers

mit impulses from generating stations and substations to the main control point at headquarters.

6. Supervisory control circuits that enable a dispatcher to control operations and to make adjustments with changing load requirements.

7. Carrier blocking and transfer trip circuits that give the company adequate protection of essential facilities in any emergency.

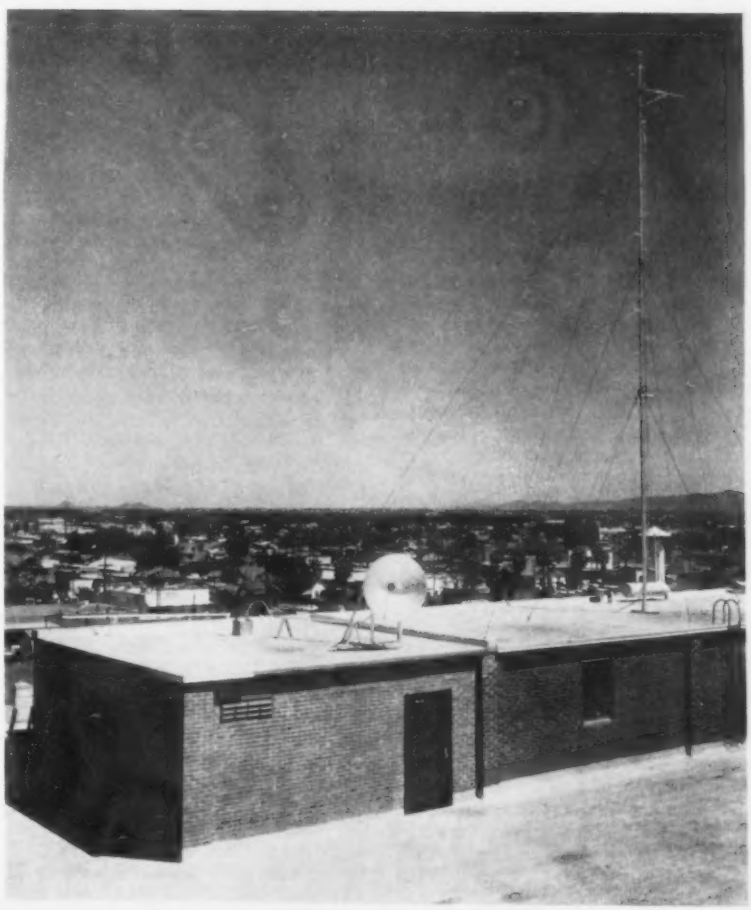
Far-Flung Communication System

Conference voice channels which are provided to all major switching and generating points via microwave are used exclusively for dispatching purposes. Patching facilities on conference channels make possible important switching operations in minimum time. Other company business that necessitates communications with distant points is carried on dial channels that connect with interoffice PBX telephone equipment at all company headquarters.

Included in the communications system is a network of permanent VHF base stations—some in distant offices, at power plants and others on mountain tops functioning as automatic relay stations. These operate into the microwave system to cover the area in which APSCO construction crews and maintenance trucks operate. Radio-equipped cars enable field personnel to keep in touch with the home office while on the job. Also, the home office knows where each car is located and, if trouble occurs in a given area, can contact the nearest service truck.

Two-way radio facilities are used by gas trucks, construction and maintenance crews, and by supervisory cars and service trucks.

VHF radio also serves the building crews who handle new construction and heavy equipment, and keeps in constant touch with line trucks, hole diggers, and crossarm crews on line stringing operations. Dispatchers use VHF for load dispatch control in their local power districts. The VHF circuits also serve systems radio headquarters, which handles routine main-



Antennas on the roof of the Arizona Public Service Co.'s main office building in Phoenix receive the signals that funnel into the city from the far corners of the state. On the left is a RCA microwave parabolic reflector, on the right a VHF antenna. The building houses radio rooms, dispatch offices and terminal equipment of the microwave system

tenance of all the company's facilities.

The VHF repeater stations operate at 153 mc and are arranged to cover the state in a semicircular pattern from Yuma northward to the Grand Canyon and around to Tucson. In order to achieve maximum coverage, 153-mc base stations receivers repeat at 70 mc to provide VHF transmission from control points not having microwave. Thus contact is maintained with any mobile vehicle that might cruise out of range of one base station and into another. By also using selective dispatching it is possible to contact a specific mobile unit in a given area. VHF mobile radio serves to keep the local areas in direct communication with each other, thereby making most efficient use of available men and equipment.

Aid to Dispatchers

In the system load dispatchers' room are three console units which tie in to microwave and VHF circuits. Each of these units is complete and may be used to control any one of seven VHF repeater stations. Understanding and using the microwave facilities under a variety of circumstances has enabled system load dispatchers to isolate trouble in minimum time. Two other control points are available in the same building for emergency purposes.

On one wall of the dispatching room telemetering receivers enable the dispatchers to make optimum use of generating facilities. Telemetered data also provide a continuous check at interchanges on power purchased from and sold to neighboring electrical systems through wheeling arrangements.

Automatic Remote Control

Microwave is now used for the complete remote control of automatic substations at Bell Switch, Litchfield, Buckeye and Apa, and has easily met the most stringent dependability requirements for such operations. Because reliabilities as high as 99% have been consistently logged through the years to justify the company's confidence in the medium, present plans call for the remote automatic operation of the company's hydro plants at Childs.

In the opinion of many in the company, effective communications have helped the utility fulfill its mission of providing its customers with good service at reasonable rates in a courteous manner. By assuring dependable communications, which make good service and economical distribution possible, the microwave link has helped keep in touch with service operations, as they expanded into the far corners of the state.

Water storage chambers for the various services required in modern outdoor steam plants streamlined by designing . . .

Eight Tanks in One

C. J. Krippes
The Fluor Corp. Ltd.

A. A. Lingo
Superintendent, Steam Generation
California Electric Power Co.

IN the early stages of designing the first 66,000-kw unit for California Electric Power Co.'s new steam plant at San Bernardino, Calif., there arose the problem of locating the deaerating feedwater heater and storage tank. Since the basic design of the plant is a completely outdoor type, there was no building structure upon which the deaerating unit could be supported. The established design procedure in this type of plant would be to use the boiler structure as a support for the unit, but this structure as purchased was not designed to support any auxiliary equipment of this weight. It was possible to redesign this structure to furnish a suitable support but, because of the boiler dimensions, an outrigger-type structure would be required, which would be unsightly as well as quite expensive. These considerations resulted in studies for the proverbial "sky hook" and ultimately were the cause of the development of the combination tank which is jestingly referred to as the "pisa tower."

Supporting structures seemed to be limited either to a conventional structural steel support or a vessel structure. The structural steel support, because of the weight of the deaerating unit and the height to realize adequate static head for proper suction conditions, was eliminated as economically unfeasible. This left a vessel-supporting structure as an alternative means of support for the deaerator.

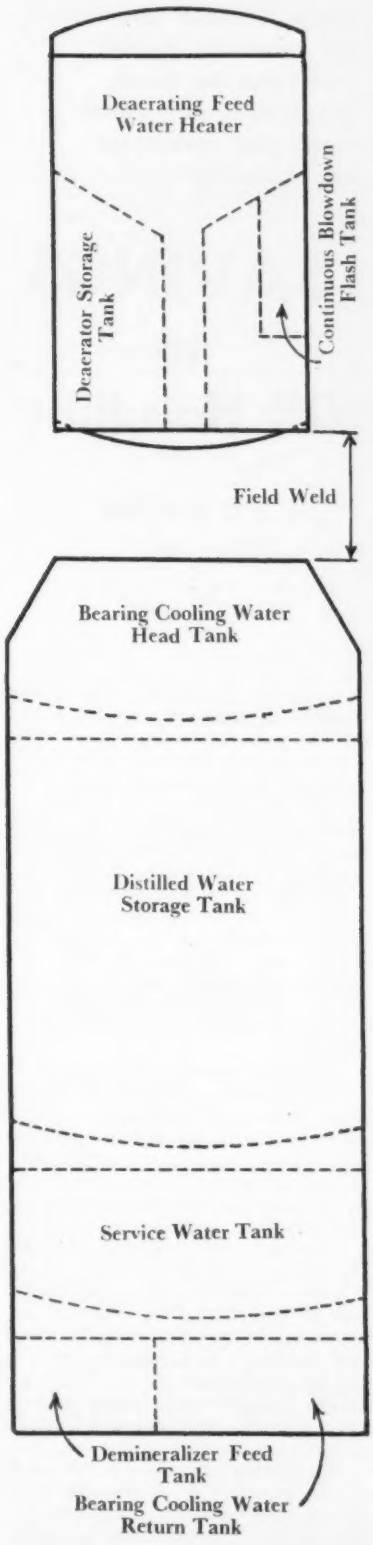
The original plant design for unit No. 1 installation included a combination raw water storage topped by a distilled water tank. The raw water storage tank provided 30,000 gal of storage capacity and the distilled water tank 50,000 gal storage capacity. The raw water storage tank was sized for use with an ultimate of four units while the distilled water tank was sized for use with units No. 1 and No. 2 only. The possibility of this vessel as a supporting structure seemed feasible but, with the capacities as originally contemplated, the ultimate vessel including the deaerating unit would have been too tall or else too large in diameter. However, by reducing the capacity of the raw water supply to 15,000 gal and the distilled water supply to 25,000 gal and using a vertical deaerator and storage tank, a practical supporting structure for the deaerating unit was conceived. This idea was the basis for the final design of the tower which ultimately consisted of eight separate and distinct chambers combined in one vertical tank.

The vertical tank, consisting of raw water storage, demineralized water, deaerator storage and deaerator from bottom to top in that order, was next studied for proper tank diameter. The deaerator and deaerator storage suitable for the heat cycle was purchased as a combination vertical unit 8 ft in diameter and 22½ ft long tangent to tangent. The diameter of the supporting tank was set at 13 ft, which gave an economical as well as a properly engineered tank. The top of the 13 ft diameter tank was tapered to an 8 ft diameter to join the deaerating unit to the supporting vessel with a continuous weld on a skirt supplied at the bottom of the deaerator storage tank.

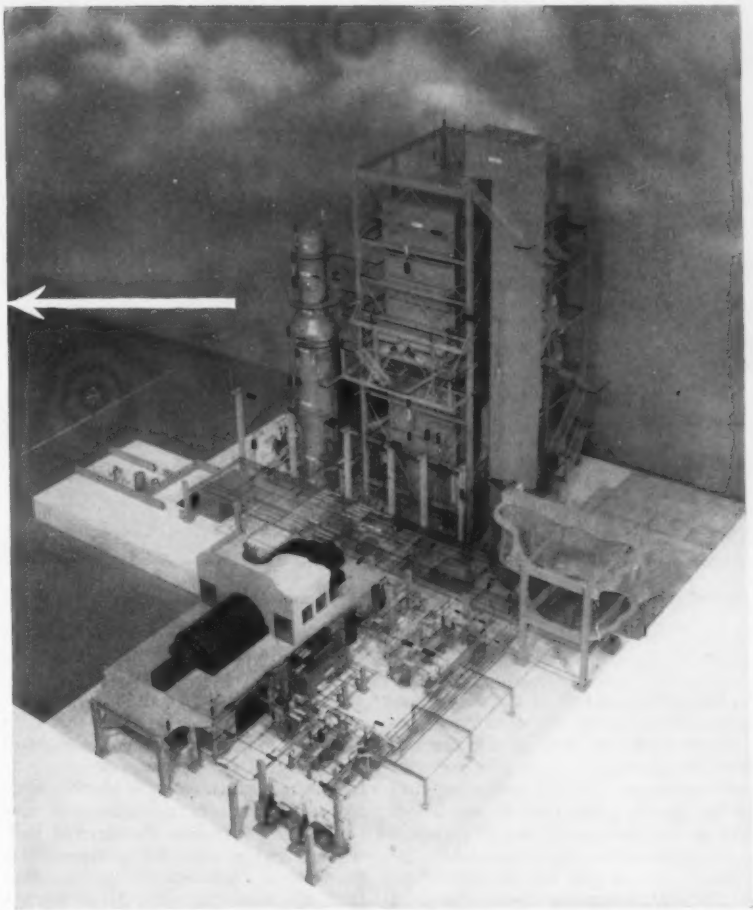
The next step involved adding a portion of the bearing cooling water system to the combination tank. This system is a constant-head type requiring a head tank and a return tank. These two tanks were added to the combination tank by increasing the over-all height of the supporting tank by approximately 8 ft. The head tank was located above the distilled water supply and the return tank was located at the base of the supporting tank.

Other Chambers Added

After grouping the above tanks into one vessel, we reviewed the remaining vessels in the plant with the idea of adding additional units to the presently designed vessel. One of these was the continuous blowdown tank which, because of its nature, could logically become an integral part of the deaerator. This possibility was discussed with the manufacturer and a suitable deaerator design including the continuous blowdown tank was evolved. Sketch No. 1 shows a section of the vertical deaerat-



Cross section through tank tower showing how various chambers were incorporated



Model of the oudoor steam station (above) shows location of the multichambered vertical vessel that encloses the eight separate water storage chambers as shown at the left

ing unit which includes the deaerator, the deaerator storage and the continuous blowdown tanks.

The final addition was a demineralizer feed tank that was located at the base of the supporting tank, separated from the bearing cooling water return tank by a steel plate partition. This tank location was well suited since the demineralizer will be operated at design flow although actual make-up will be small. The flow will be maintained by adding continuous blowdown and distilled water to the raw water make-up. This system will reduce the costs of processing make-up by using the continuous blowdown and also by eliminating demineralizer bed troubles that are caused by varying flow rates and by starting and stopping the unit.

The completed supporting tank is as shown in the sketch. It will be noted that special design requirements were needed. A horizontal diaphragm was provided below the bearing cooling water head tank to divert any possible leakage from the distilled water tank. The distilled water storage tank was lined with protective coating to eliminate possible corrosion. A special type of heat insulation cover was provided for the bottom head of the deaerator storage tank to prevent loss of temperature in the feed water and increase of temperature in the supply bearing cooling water.

A review of the final design can be summarized as follows:

1. Savings were made by eliminating an expensive structural steel deaerating unit supporting member.
2. Floor space was saved by grouping several vessels into one unit.
3. Piping was greatly simplified with a corresponding saving.
4. General appearance of plant was enhanced by the simple structure.

In general, this type of design is applicable to an outdoor-type plant where a building structure is not required. The financial and space savings are worth-while and it is believed to have operating advantages.

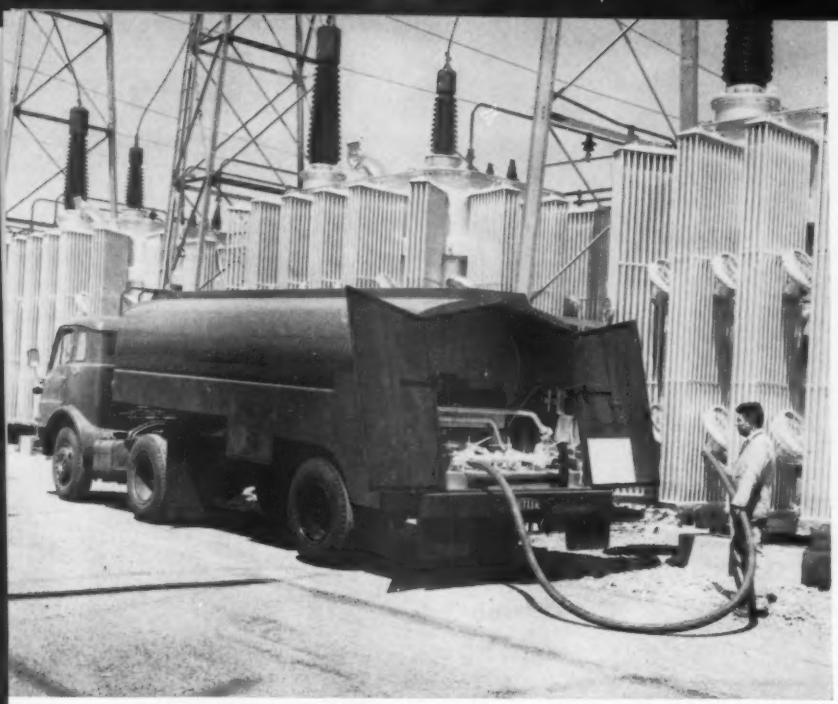
Electrical West—Vol. 117, No. 4

Pacific Gas and Electric Co. substitutes mobile equipment for fixed installations and effects substantial investment and operating . . .

SAVINGS in Oil Handling

J. L. Buckley*

Pacific Gas and Electric Co.
San Francisco



One of four oil handling tank trailers used by PG and E in its substation maintenance

Methods of handling the vast quantities of insulating oils used on a system as large as that of PG and E merit continuing study to the end that minimum investment, operating and maintenance costs can be achieved. Major equipment on the PG and E system contains approximately 12,000,000 gal of oil, an investment of $2,640,000 at current prices. This does not include the oil contained in the 4-kv to 22-kv oil circuit breakers, of which several thousand are in service.

The problem of storing, pumping, testing, filtering and reclaiming this quantity of oil involves substantial investment in facilities as well as operating expense of no small magnitude. For example, for the period from 1918 to 1950, permanent steel piping systems for oil handling were installed in all major stations with tank capacity at each station to hold twice the amount of oil in the largest piece of equipment. Usually two tanks were provided to permit filtering between tanks. A filter press, oven and oil pump were installed, usually in a separate 12x12-ft house.

These systems were costly, varying with the size of the station from $5,000 to $20,000. The total investment was high because of the large number of stations on the system, and it was growing rapidly due to a high rate of system expansion. These piping arrangements were satisfactory for handling oil but maintenance cost was high in some areas due almost entirely to corrosion of the pipes.

About 1950, butyrate plastic piping was tried in an effort to eliminate the corrosion. The first installations were successful and gave no trouble for more than a year. However, this type of plastic has a high rate of expansion and contraction because of temperature changes but, worst of all, the pipes we used actually decreased in size after being installed. Because of lack of experience with this material and because of inadequate information from the manufacturer, these characteristics were not compensated for and leaks developed. In solving the corrosion, a new problem was created. Changes in layout and installation were made and these plastic piping systems are still in use and operating successfully.

Subsequently, a kralastic type of plastic pipe (which has less than half the thermal expansion of the butyrate plastic and no tendency to shrink with age) was tried. By careful design and installation, these latter piping systems were free from defects and are operating successfully.

Investment Aspects

These problems made management acutely aware of the large investment in insulating oil installations throughout the PG and E system. In January 1954 there were authorized, as part of the station construction program for the central and northern sections of the company, $65,000 in station oil handling and filtering systems. Also there was proposed, but not yet authorized, an expenditure of $105,000 in the following few years. Even this total amount of $170,000 would not have completely equipped all new stations.

Portable oil handling and filtering equipment appeared to be the answer so the company designed and purchased two tractor tank-trailer combinations, one for principal use in the central or Bay area and one for the northern area. Each of these combinations consists of a tandem axle, 145-hp gasoline engine-driven tractor with two 3,500-gal two-compartment, tank trailers. Each tank trailer is equipped with a 100-gpm electrically driven oil pump and a 30-gpm oil filter with piping and portable oil hose to permit the handling and filtering of oil with all the flexibility of the old fixed systems.

The total capacity of 3,500 gal for each single tank trailer unit is not sufficient for large stations so a single large tank with valves for connecting to portable equipment was installed in such stations. The total cost of the two tractors and the four tank trailers was $59,000, which is a considerable saving over the proposed $170,000 already mentioned.

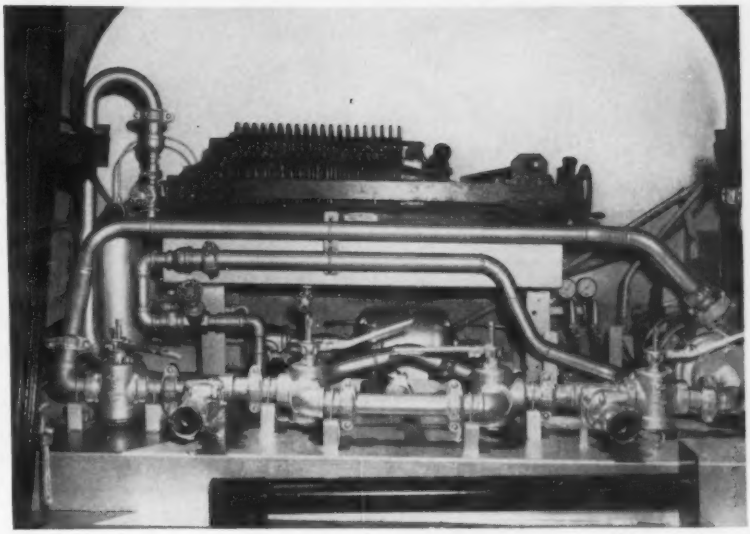
This portable equipment was delivered in May 1955. Despite limited experience, this method of oil handling and filtering is so satisfactory that oil handling equipment is not being installed in any new stations and as existing piping deteriorates it is abandoned.

The southern part of the PG and E system has only small portable units for oil filtering at present. After further operating experience with the

* Based on a paper presented before the Engineering and Operating Section, PCEA, March 1956.

new portable equipment has been obtained, at least one unit for that area will be purchased. The handling and filtering will then be very flexible with the possibility of shifting units from one area to another in emergency.

In practice, the tank trailer can be pulled up to a substation and left there to perform routine pumping, filtering or maintenance operation while the tractor is used elsewhere. The tank trailer performs all of the functions of pumping, filtering and transferring that could be accomplished by a permanent fixed oil handling installation. When oils reach the point where reclamation is necessary, the tank trailer is available to move the oil to the central oil storage area as described below.



Close-up of filtering and pumping equipment on the rear of the oil handling tank trailers

Oil Maintenance Procedures

The oil in transformers, regulators and oil circuit breakers is tested for its insulating value at least once a year and is filtered when tests indicate that it is below the standard dielectric strength of 22,000-v breakdown in a standard 1/10-in. gap.

Acids in transformer and regulator oils cause a sludge that deposits on terminal boards, coils, in oil ducts, etc. The amount of acid present in oil is a rough indication of the amount of sludge.

A chemical acidity test is made to determine whether acids are present. The results are expressed in terms of the weight in milligrams of potassium hydroxide required to neutralize the acid. An acidity or neutralization number of 0.2 indicates that 2/10 mg of potassium hydroxide was necessary to neutralize the acid in one gram of oil. In average new insulating oil, the neutralization number is less than 0.01. As time goes on this number increases, slowly at first, but after reaching a neutralization value of 0.5 the rate of increase becomes quite rapid.

When initial tests of insulating oil in station transformers show an acidity under 0.3, the frequency of future tests can only be determined by experience, possibly every three or four years, bearing in mind the various factors responsible for acid formation such as temperature, loading, exposure to oxygen, etc. Oil that tests between 0.3 and 0.6 is tested once a year. When the tests show an acidity of 0.6 or higher, oil should be replaced at an early date. The oil in modern gas-sealed transformers should give 15 years service before it has to be replaced.

Inhibited oils are being used to a limited extent on a trial basis only. Preliminary tests indicate that acid build-up is much slower initially but as the life of the inhibitor is expended it is possible that the acid formation may accelerate to a rate equal to that for noninhibited oil. This has not been proved in service as yet, but it is a factor that is being watched.

OCB Procedure

A standard form is provided by the operating department for its operating personnel so that circuit breaker operations may be recorded and evaluated for all breakers from 2.4 to 220 kv. Each fault operation is assigned a certain number of units based on the severity of the fault and the capability of the breaker. When the total of these units reaches 100, the breaker is scheduled for overhaul. The maximum period between overhauls, regardless of the total number of units, is three years.

PG and E has on its system more than 200 220-kv, 530 100-kv and 650 69-kv oil circuit breakers. On the minimum maintenance basis given, 1,200,000 gal of oil per year will be handled for breakers only. Actually, because of emergencies, heavy faults, etc., the amount of oil handled is considerably more than 1,200,000 gal.

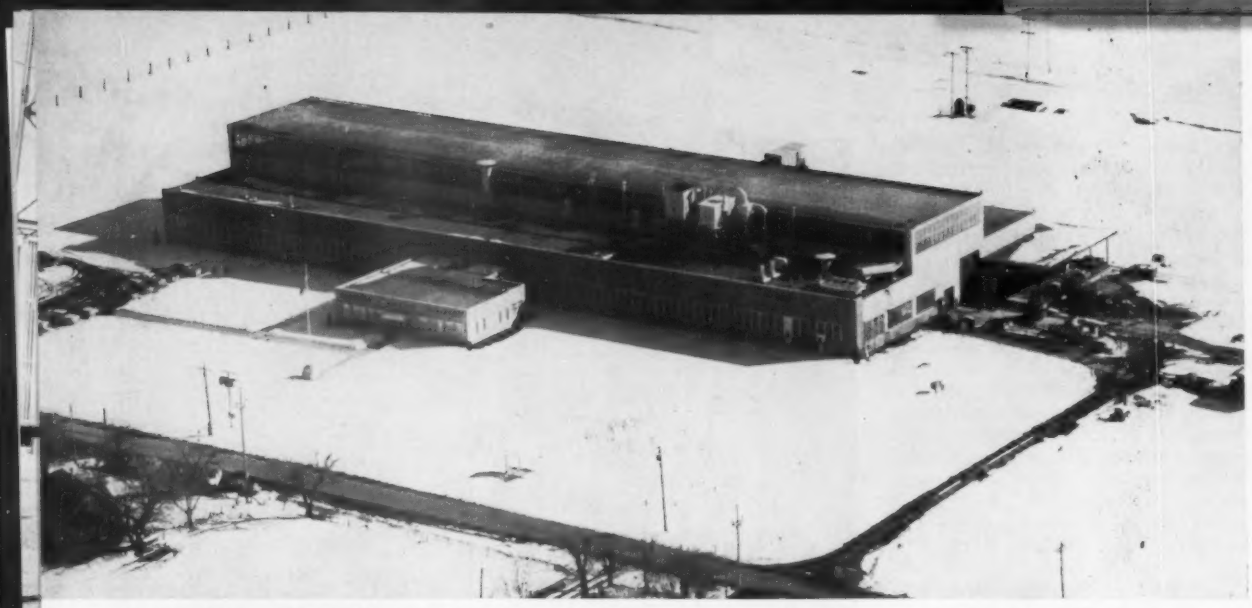
Oil Reclaiming Economics

When oil fails to pass acidity tests it is replaced. When oil fails to pass voltage tests, the equipment is deenergized and the oil is filtered. If filtering does not restore the dielectric strength the oil is replaced. The minimum time between filtering and reenergizing equipment is eight hours.

Each division sends the oil that is to be reclaimed to storage areas at Emeryville or Fresno. The cost of transportation varies from 1 to 3c per gal. Oil is picked up at the storage area by the company that is to refine it, transported by it to its plant, processed to meet PG and E specifications, and delivered back to the storage area for 8c per gallon with a maximum allowance of 8% for wastage. This makes an out-of-pocket expense of about 11c per gallon, not counting overhead and warehousing. New oil costs approximately 22c per gallon at present. Thus 11c per gallon is saved by reclaiming oil. Experience with reclaimed oil shows that it is fully equal to new oil in all respects. When it is considered that an average of 500,000 gal of oil per year is reclaimed in this way, an appreciable dollar saving is realized.

Incidentally, this amount of reclaimed oil is handled with a central storage capacity of 67,300 gal. At Emeryville storage, there is tank capacity for 12,000 gal of new oil, 22,000 of reclaimed oil, 29,100 gal of dirty oil and 4,200 gal for operations. It is anticipated that this capacity will be substantially increased as more efficient handling procedures would be effected thereby.

Altogether, in all operations, approximately 5,000,000 gal of oil per year with a value of $1,100,000 passes through PG and E insulating oil pumps. The total quantity pumped may decrease somewhat even though we are adding oil-containing equipment since modern transformers and breakers will produce less contaminants in oil. However, considering the large quantity of oil used on the large system, engineering studies that lead to more efficient and economic operations are certainly justified. The decision to shift to mobile oil handling equipment on the system appears to have been a move in that direction.



Air view of General Motors Electro-Motive Division diesel locomotive factory rebuilding center shows outdoor substation upper right

Flagpole base conceals building floodlight

Make Them Over

Diesel electric locomotives are fast replacing steam. To serve the railroads and utilities using diesel electric equipment, General Motors recently opened a factory branch of its Electro-Motive Division at North Salt Lake. Here both the engines and the electrical generators and motors are remanufactured.

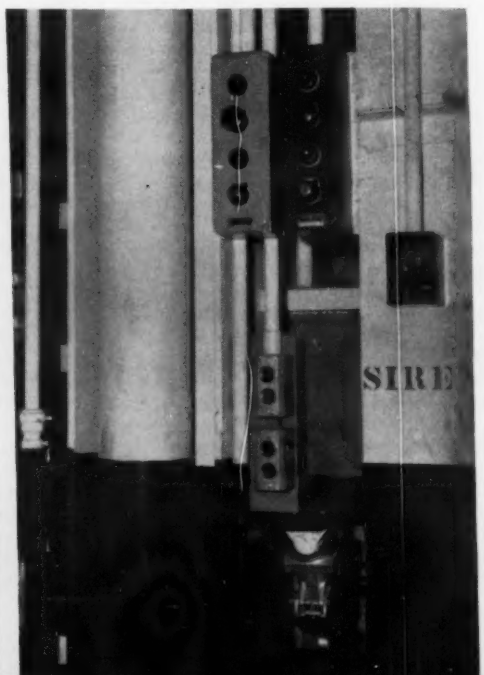
The electrical facilities of the plant itself represent a modern simplified distribution system design. It was installed by Wasatch Electric Co. of Salt Lake City.

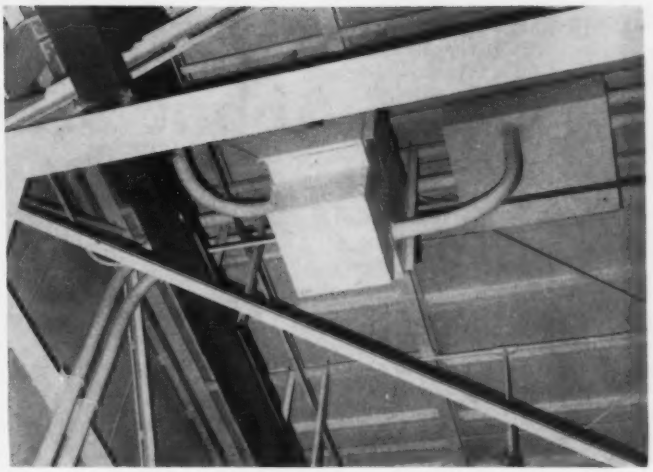
Power is received from a 12,000-v line at the rear of the property. Here a 500-kva substation, 300 ft from the building, transforms the 12,000 to 480 v. This comes underground in transite duct in two parallel runs of 500 MCM neoprene cable to a pull box inside the rear wall of the building. Conduit from there runs up the wall and across the roof trusses to feed two parallel runs of bus duct that feed both ways the length of the building from the center.

Crane fed from protected trolley duct.

Pendant control cable for movable machines.

Locked push buttons to protect workers.





Two 480-v runs from sub terminate in this pull box inside rear building wall; feed up wall to dry-type transformer, bus duct

All loads are taken off the bus duct by means of plug-in, fused or circuit breaker protected units. The 480 v is reduced to 120 v by means of dry-type transformers also mounted above the trusses. This is used for lighting and for such 120-v outlets as are needed for tools, etc.

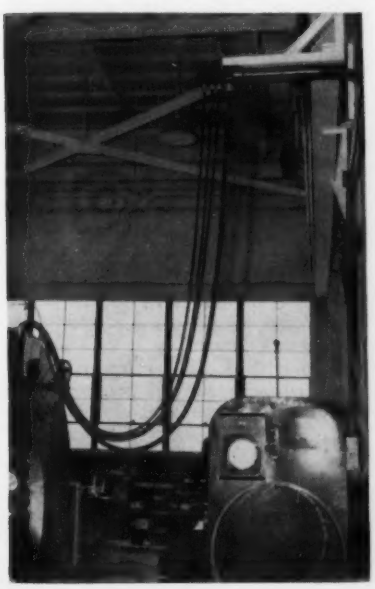
Power for two cranes, of 5- and 7½-ton capacities, is also tapped off the bus duct for the protected trolley duct used to feed the cranes. The push-button stations controlling the cranes are provided with lock buttons as a protection to workers.

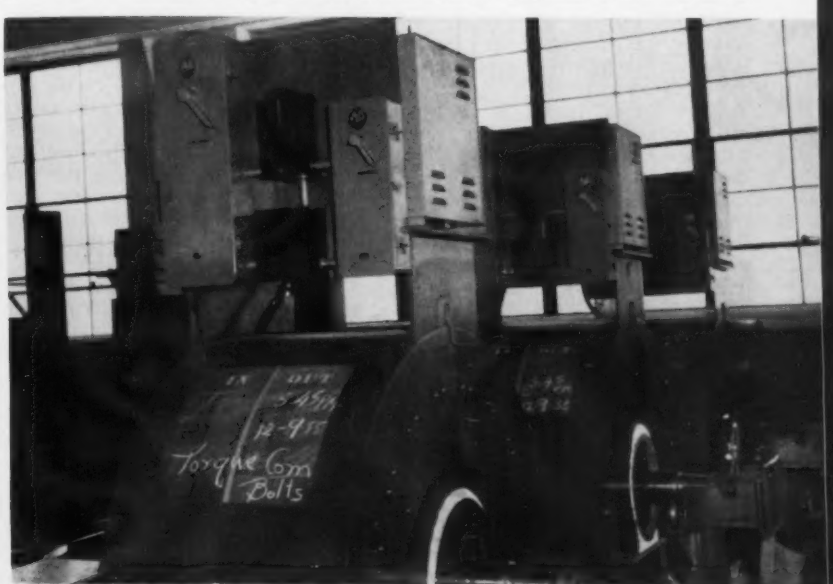
The numerous machines in the plant are fed individually through plugged-in fused units tapping the bus duct at the nearest location. Where a machine moves—such as the infrared baking ovens that are moved over rotors to bake the coils—flexibility is provided by using looped cables. Similarly, push-button stations to control such machines are mounted on a flexible pendant armored cable.

An alternate grid pattern of color-corrected mercury 400-w and incandescent 750-w lamps in high-bay reflectors is used to light the general area, with additional local lighting on machines as needed. In some cases a 1-kw transformer reduces the 480-v machine power source through a disconnect to the light. As many as 116 No. 14 control wires between operator and machine are used on two large milling machines.

Protected crane trolley fed from bus duct

Movable baking ovens fed and controlled by cables. Infrared baking ovens encircle rotors. Control equipment is mounted above





Grounding, Center of Confusion—9

What About Static Charges?

Tom Hughes

Electrical Engineer
California Division of Industrial Safety

In the preceding two groups of articles under this title, there has been discussed the confused thinking connected with two very real phases of the electrical industry. In this final group we discuss that much misunderstood stepchild of electrical science, known as "Static."

Scientists and engineers should seek a better name for it. The word static is derived from ancient languages and originally meant: to stand still. In contemporary rhetorical usage it expresses stability or a state of equilibrium. On the other hand, the so-called static charges built up on adjacent objects at opposite polarity are distinctly unstable and seeking to return to the company of their proper molecular companions.

Just as the too-liberal use of the word "grounding" in electrical applications has misled the public and electricians from our true objectives, the use of the word static has kept the later studies of that subject tied to the old original theories, to a great extent. And, stirring up the recent and justified concepts with the old and obsolete ones of former generations, we find that word grounding again.

The desire to ground the objects, where the static nuisance is appearing, is not without some merit (as we shall see later) but we must object once more to the word grounding because it detracts from a true conception of the problems involved.

The average reader is interested only in practical application of science but we ask your indulgence in a brief discussion of elementary principles. At some time or another we have all studied the theory of electrostatics but, more than likely, we have retained some misguided thoughts or placed an improper emphasis on the related facts.

Most of us remember that the rubbing together of unlike substances would produce a negative electric charge on one and a positive charge on the other. And, with the interest in our atomic era, most of us know that an atom is made up of a complex positive nucleus surrounded by a system of a precise number of negative electrons moving in inner and outer orbits.

In most substances the positive nucleus is ready to gather in an additional electron or two from adjacent atoms or molecules if they can get away with it. In some elements the electrons are freer to migrate than in others and we say those elements are good conductors or they are poor dielectrics.

When two substances are brought into physical contact with each other it is like bringing two beehives against each other. We can think of the electrons as bees and the honeycombs as atoms or molecules. In a good conductor the honeycombs are open and the bees chase around at will. In the good dielectric the combs are mostly full and closed and the bees are tired and do not wander around.

If two good conductors are brought together we can imagine the bees chasing back and forth through each other's combs and when the conductors are moved apart again the bees all rush back where they belong. If, on the other hand, a good conductor and a good dielectric are brought together, the nosey bees from the conductor wander over among the difficult passages of the dielectric. When the two substances are separated the nosey bees can't get back home in time and are left behind.

Thus the dielectric has too many negative electrons and presents a negative charge while the conductor lacks enough electrons to neutralize the positive nuclei and presents a positive charge to surrounding objects. But don't quit us here. This is where the layman usually jumps at conclusions.

There is a big difference between atoms and beehives and this is the feature you have no doubt forgotten since your school days. The bees on the dielectric gradually work their way out of the maze and collect on the side from which their companions departed. But, if the conductor is brought near the dielectric again, they don't prepare for a happy reunion.

Instead (and this is the most misunderstood feature of electrostatic charges) they scare the living daylights out of the bees (electrons) on the nearest side of the nearing conductor and chase them over to the far side. By this strange power they have presented a negative charge on their side of the dielectric and a positive charge on the nearest side of the approaching conductor.

The force that these electrons are able to exert on other free electrons, across the intervening space, is known as an electrostatic field. This example seems reasonable for the former mating conductor but what if a fresh conductor (with all atoms neutral) is brought near the negatively charged dielectric?

Strangely, the electrostatic field of the surplus electrons manages to chase a like number of electrons away from the adjoining side of the neutral conductor and to present a positive charge on its near side. This charge, which appears on any conductor that is brought near an electrostatic charge, is called an induced charge.

It is these induced charges that cause many errors in the attempts of people to deal with static. If the charged body is brought near a neutral conductor it induces a charge of opposite polarity on its nearest surface. If the bodies are then brought together and the initial charge is great enough, a spark jumps the gap before contact is made.

And get this: the discharge takes place regardless of whether the neutral body was grounded or not. That is why we would like to have that word, grounded, get lost. In some cases the ground does figure in the problem and we will cover those later on.

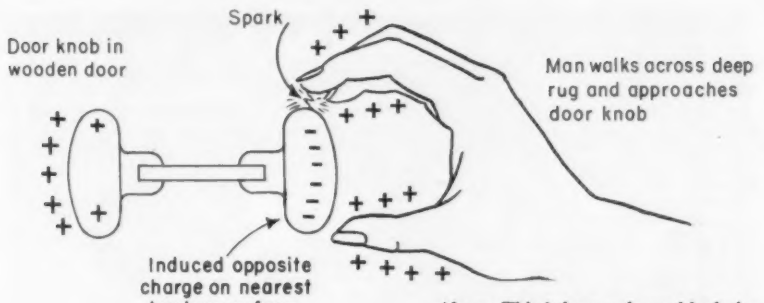
Condition of the Atmosphere

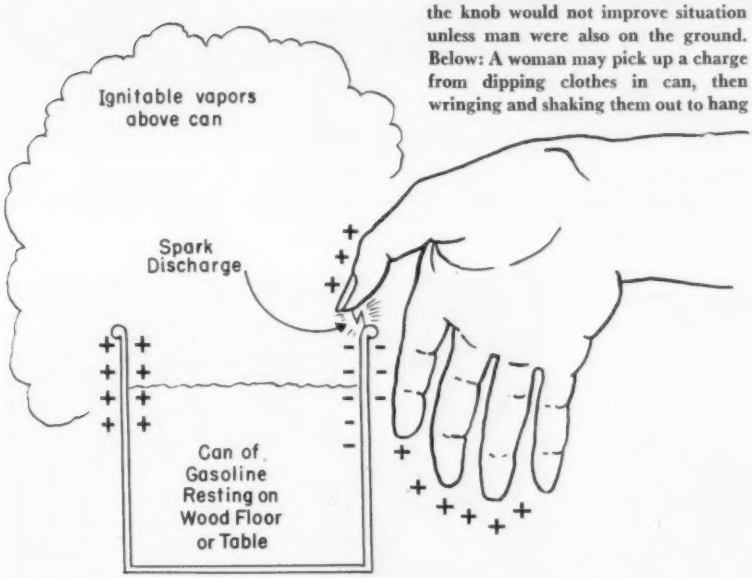
In the foregoing examples we have considered the charged bodies and the air surrounding them in a normal state. When we vary the temperatures or surfaces of the dielectrics we present another set of conditions. The only perfect dielectric is a vacuum. Its conductance is zero.

When air is dry and clean it is a fairly good dielectric at normal atmospheric temperature. Winds of dry air with dust in suspension will produce electrostatic charges on objects in passing. Humidifying air under the proper conditions overcomes its dielectric property. On the other hand, ionization of air makes an effective conductor and dissipates static charges on objects in its midst.

A fluid is said to be ionized when electrons are freed from the atoms and thus allowed to move around between the atoms. This is also the state of a conductor, as you know. Thus it is a steady interchange of electrons between a series of atoms that constitutes a flow of electric current.

In humidification it is the suspended substance that becomes the conductor


Spark
Door knob in wooden door
Man walks across deep rug and approaches door knob
Induced opposite charge on nearest knob or surface



Above: This is how a charged body induces an opposite charge on any conductor brought near it. Grounding the knob would not improve situation unless man were also on the ground. Below: A woman may pick up a charge from dipping clothes in can, then wringing and shaking them out to hang

but in ionization the air becomes a conductor. As air or any fluid is heated to a higher temperature some of the electrons of each atom are forced to outer orbits of their atomic system and the system is said to be excited. As the temperature is further increased some of the electrons of the outermost orbit are squeezed out of the merry-go-round and become free to enter other atomic structures or to migrate. In this state the fluid is said to be ionized.

In solutions or electrolytes the positive and negative ions are available to reunite with ions of other compounds placed in the solution or to plate themselves (in the case of metallic salts) on the surface of electrodes placed in the solution. In the case of batteries or plating baths, there must be a flow of electric current for such an interchange to take place.

When air becomes ionized (full of free electrons ready to migrate) it is primarily an electrical conductor and the spacing of bus bars within the ionized stratum is of no avail. When a heavy arc occurs in electrical equipment the heat ionizes surrounding air; makes it conducting; and tends to prolong the arc or even extend its scope to other phases. Thus it becomes a chain reaction and, in the case of an enclosed switch or starter, the hot gases force the cover open.

Another means of ionizing air (to a lesser degree) is by bombardment of the atomic systems and knocking individual electrons out of their orbits. By this means freed electrons become available and that stratum of air becomes a conductor.

Making Use of Ionized Air

In our explanation of ionization we have deliberately gotten far afield from a discussion of electrostatic charges because we wanted to dispel any confusion that exists in the minds of many people about the use of the word ionization in connection either with air or chemical solutions. Chemically there is a vast difference in possibilities but electrically it means that we have in either medium a conductor.

Going back to our original description of the stranding of free electrons by the contact and subsequent separation of two substances we see that we are concerned primarily with a route home for the strays. One logical and substantial return path is a bond wire between all conducting parts of the substances concerned.

Here again we are concerned with the physical nature and shapes of the substances. If one substance is a dielectric and the electrons must laboriously work their way over to the leeward side before they can enter the homeward channel (bond wire), a lot of them (a heavy charge) must be piled up before it is effective.

And here is a good place to bring up grounding, that panacea for all evils (in the minds of too many people). We see here that the place where the displaced electrons are most eager to get to is where they were stranded from. In the case of the charge established by the rubber tires on a moving vehicle, they want to get from the vehicle to ground or vice versa but in most industrial cases their separation was entirely disconnected from contact with the ground.

While there is some justification for connecting everything in the picture to the ground we want to re-emphasize that the most important path is the bond wires between the parts of machinery where charges originate.

On the other hand, remember that we pointed out the phenomenon of the electrostatic field that exists around a charged object and how that field tends to induce a charge of opposite polarity on nearby conductive objects. Because the earth is the largest nearby surface and may or may not be in a conductive state, there is the possibility that some good may come from attaching our machinery bonding network also to ground.

But bonding is the least desirable path of return for our stray electrons. Depending on the shape of the charged object, the electrons may have to pile up to an unwieldy number before they are inclined to use the bond wire (just as water must rise up to the overflow opening in a sink or lavatory).

Considering that the establishing of charges by contact and separation takes place with air as a surrounding dielectric medium, the logical and most desirable return path is through the air itself. The textile industry has utilized this path by humidification for almost a century.

Humidification is a less desirable means because it requires continuous control or supervision to maintain the right balance and it adds contamination to the air around products that must remain white or clean.

For years the printing industry has ionized the air at certain locations by applying a row of flame to paper passing through roll presses. Here again control or supervision is required.

Weers has 80 f-c in his office from 9 light strips, Guth Gratelite ceiling, 12 ft high

Drafting room, 53x12½ ft, lighted to 140 f-c from louvered units over tables mounted 7 ft 6 in. from 9-ft acoustical ceiling. Each man has 5½ ft of reference table and shelves

Design for Design

How a consulting engineer designs for others is usual. How he designs his own premises seldom attracts notice. But Arthur Weers, Weers Electrical Planning Service, Denver, designed several features in his compact office. In addition to those shown, there is a conference room and a room equipped for making prints and duplication of specifications. The conference room is lighted to 55 f-c from Day-Brite Mobilex ceiling plastic panel units with a louvered recessed unit over a picture in the recess. All lighting is on low-voltage control with masters in both drafting room and office. Alongside the drafting tables a reference space provides each man with 5½ ft of table and shelves for books, tools, etc. A run of the plug-in strip in the wall furnishes power for erasers and lamps.

Like coat hanger, dowel rod with hook is used to hang up plans. Plans are stapled along one edge; 500 are accommodated on rack

Supported from trolley duct, several sample commercial and industrial fluorescent and incandescent fixtures are displayed for clients

Arthur Weers devised fixture drawings printed on adhesive acetate to affix to master plans speedily to illustrate fixture schedules

ELECTRICAL WEST Contractors' News Letter

QUICK NEWS ON TRENDS, LAWS, CODES, MATERIALS, EQUIPMENT, COSTS, WAGES, ETC.

Two inspectors' conventions and the big contractors' event brought news of many new devices and products, techniques and ideas to the construction branches of this industry in September. The Northwestern Section, International Association of Electrical Inspectors, met in Salt Lake City Sept. 10-12, (see p 119) and is reported in this issue. The Southwestern Section met in Berkeley Sept. 17-19, too late for coverage. It and the National Electrical Contractors Assn. convention and exposition will be covered next month. Likewise, the National Association of Electrical Distributors' meeting in Phoenix, Oct. 1-3.

The season for it

What to do about the high capacities being used in today's office buildings, schools and factories, and how to interrupt them safely, seemed to be a common concern of both groups of inspectors. The National Electrical Code has been slow in providing any guidance, leaving inspectors somewhat on a limb. If equipment burns off, due to a fault, they do not want to be immolated by it themselves. Equipment to provide high-interrupting capacity only recently has become available.

It's a puzzlement

The 1956 edition of the code, with the relatively minor changes to be found in it, did not come from the printers in time for scrutiny at the inspector meetings. This is not new. The printing of the code is a monumental job.

Missed again

A new form or a rewriting of the code, being undertaken by Frank Thornton, retired Westinghouse code authority, was not finished in time for consideration but should be forthcoming soon.

Complete rewrite

Floyd Shipp, one of NECA's most able chapter managers, of the Utah-Idaho Chapter, Salt Lake City, leaves that post, to the regret of the members, to join General Electric Supply Co. as the Salt Lake City store manager. Shipp worked for General Electric's Wiring Materials Division in San Francisco area for a few years after college. He also ran a contracting business in Midvale, Utah, for six years. It is now operated by his brother. A successor, as chapter manager, had not been named at press time.

Loss and gain

Advance registration for the national convention of NECA in San Francisco Sept. 23-29 promised to fill the hotels and the meeting halls and make the exposition of electrical materials and devices running concurrently with it a big success. For the first time, the board of governors' meeting was to be opened to visitors in a gallery at the request of President Oliver Burnett. This trend away from supersecrecy will gain the NECA more respect.

Should be whopper

Most controversial issue to be decided at the NECA convention probably is a proposed constitutional change to allow the headquarters to set up more branches. The chapters see in this a loss of autonomy and a centralization in the association direction from Washington. Quite generally, the Western chapters may be found voting against it.

Fear remote control

Electrical Contractors Division of the Bureau of Home Appliances of San Diego County has set Oct. 30 as the date for its annual meeting. As customary, there will be a display of electrical construction products around the auditorium and in adjacent rooms and a program of speakers with messages particularly valuable to electrical contractors.

Home town convention

Wages in the Puget Sound area were increased 10c an hour Aug. 27 by the decision of the Council of Industrial Relations for the electrical contracting industry. The scale went from $3.10 per hour to $3.20 with another increase of 5c to become effective Jan. 1. The Seattle local of IBEW had demanded a 13c increase now and 12c Jan. 1.

Settled

A right-to-work measure, initiative 198, will be on the Washington State ballot on Nov. 6, despite a strong campaign by organized labor to stop signing the petitions or withdraw names from them. Of the total of 64,373, only 266 were withdrawn.

Public protest

Served notice by local No. 6 in San Francisco, the electrical contractors were gasping at the demands Charles Foehn told them he was going to make at the first of the year. The present scale is $3.61 per hour, including vacation, health and welfare, etc.

Hard to swallow

Foehn told them he would demand the scale recently awarded the plumbers, which is $3.45 base pay, 12½c pension, 12½c health and welfare, 15c vacation fund, a 2½c convalescent fund plus a joint industry board fund of 2½c and a surplus fund of 25c, bringing the total to $4.16 per hour, a 52c increase.

The works!

Similar demands were made by local 213, IBEW, in British Columbia where 60c an hour pay boost, plus 8c to a welfare fund, would up wiremen's rates from $2.42 to $3.02 an hour, an all-time high in Canadian construction wages. A conciliation board award of 28c an hour spread over two years was rejected.

Learn fast

Portland's new electrical code will become effective Oct. 1. Like previous codes, it is a big one, with many modifications to the National Electrical Code. Important variations will be analyzed in a future article. The previous code of the city was 10 years old. Joseph Gray, chief electrical inspector, explained these changes to the August and June meetings of the Oregon Chapter, IAEI, in Bend and Portland, respectively.

Roll their own

Some credits due but omitted in the September Lighting issue. Lack of space and the incompressibility of type can be charged for the omissions, which were unintentional. The entire page 113, entitled "Indoor Lighting Gives Efficiency," is to be credited to the Certified Lighting program in northern California. Each of the pictured installations was a certified job . . . At the bottom of page 108, the Country Club dining room in Salt Lake City was lighted as well as designed by Vern Sharp of Sharp Electric Co., one of the city's most progressive lighting contractors.

Apologies please

Two well known old-timers of the Bay area passed away last month. Harold O'Brien, known for years as Square D Co. representative in northern California, who retired then went back to work for Zinsco, died Sept. 10 . . . George W. Barker, originally an editor on the "Journal of Electricity," later with Allied Industries and then manager of Northern California Electrical Bureau for years, died in Santa Barbara, aged 71, Sept. 2. He was a colonel in the U. S. Army and retired after the war to Santa Barbara.

Veterans answer call

Perhaps you have heard it—Larry Carlisle, chief electrical inspector of Eugene, Ore., retired July 1. He had been inspector since Feb. 1, 1940, with two years out as an Oregon State inspector. He is succeeded by Don Swartz, who has been in the department seven years. Charles Nickens, former contractor, has been added to the staff . . . E. H. Hills, who has been city electrician for Burlingame, Calif., for the past six years, resigned to become associated with the Safe Electric Co. . . . Ben Wheater, retired chief electrical inspector of Long Beach, has joined Blakeman Bros. Electrical Mfg. Co. of Los Angeles as consulting engineer . . . Arthur Veit, chief electrical inspector for Los Angeles County, is soon to have an assistant. Joe Roohan of the Department of Water & Power, an Iowa Tech graduate, is slated for the job.

Inspector shifts

Ray P. Grosse, popular Graybar manager of inside construction sales in San Francisco, has been promoted to branch manager of the Graybar house in El Paso, as of Oct. 16. He replaces C. M. Newbill there. The El Paso house reports to the Dallas district. His whole Graybar experience has been in the Bay area, starting in 1934 as shipping clerk in Oakland. In 1936 he was operating manager there and then in 1941 transferred to San Francisco.

Promoted

San Diego Gas & Electric Co. recently announced that it would supply a 480-v service for 480/277-v applications under certain conditions.

Available

G-E Supply will soon open another branch in Great Falls, Mont. It already has one in Butte and Billings, according to Gene Fleming, supply manager for the district, Salt Lake City. It is part of the supply company's new program of furnishing greater service to the small contractor.

Grass roots

Highway lighting safety will be discussed at the Governors Highway Safety Conference, Sacramento, Calif., on Oct. 5. The technical subcommittee of the PCEA street-lighting committee will participate. A special movie has been prepared by PCEA for showing at that time.

See safety

Daylighting in schools of the Seattle area is being studied by a special committee of the Puget Sound Chapter of the Illuminating Engineering Society of which Beverly Travis, consulting engineer, is a member. The data collected will be supplied IES on its over-all project of evaluating daylight as a medium for illumination in schools. Continuous-reading graphic meters with four cells will be operated from 8 a.m. to 5 p.m. to obtain the records. These will be correlated with the different types of fenestration so that prediction can be made as to what illumination values may be obtained in various interiors.

Will get the facts

IBEW Local 786 won the right to bargain for the Westinghouse plant workers at Sunnyvale, Calif., after winning a NLRB election from the United Electrical Workers. Final agreement on the new contract has just been reached.

New bargain

Nominees for the district vice-presidents of NECA in the West have just been announced. W. R. Grasle of Portland has been nominated for re-election as vice-president of District 6. Ralph E. Johnson of Sturgeon Electric Co., Denver, who formerly held the post, has been nominated for District 8 vice-president to succeed Phil Robbins of Salt Lake City. If the new District 9, comprised of California and Nevada, is voted, as indications point, a vice-president for that district will have to be appointed. The NECA convention will be in progress as this goes to press.

Slate told

Industrial electrical construction was exempted from the Contra Costa County of California electrical ordinance originally because of pressure from the big industries. However, effective in August, it is now mandatory to take out electrical permits for industrial construction in the unincorporated areas. Inspection is still exempted for the big companies who maintain an electrical department, and presumably comply with the state electrical safety orders.

One more step

To settle the question for the San Francisco Peninsula, the Peninsula Building Inspectors Group recently issued notice that all jurisdictions would require electrical plans for apartment house and commercial or industrial jobs and that separate cooking units built in will henceforth be required to be separately circuited and not grounded to the neutral conductor.

Built-in range jobs

Dual services for air conditioning equipment in residences is now official, according to a bulletin of the Los Angeles Department of Water & Power. Previously, dual services, as reported in Electrical West, was on an experimental basis. It means that single-phase residential air conditioning will be served by a power service, and that lighting and small appliance loads another service, both metered through a single two-element meter. Service drops will be two triplex cables from two separate sources of supply.

Decide it works

Aluminum conductors and hardware are being subjected to one of the severest tests possible as a joint project of Hawaiian Electric Co. and the Kaiser Aluminum & Chemical Corp. Preliminary tests have been made on steel and aluminum hardware and now a secondary midspan test on triplex cable is being conducted to see how the connections stand up in the highly humid and salt atmosphere of the Islands. Similar tests are being installed on Kauai, Molokai, Maui.

Tough testing

Milo A. Cain, for 25 years the Coast Counties Gas & Electric Co. and two years Pacific Gas and Electric Co. representative contacting contractors and dealers and originally a lighting engineer, retired Sept. 1. He served in the Santa Cruz area. He also acted as secretary for the Santa Cruz-Watsonville Gas & Electric Appliance Assn.

Retires

A five-year schedule of dates ahead for its annual meetings is now being developed by the various sections of the International Association of Electrical Inspectors. The Northwestern Section has not yet formulated its program but the Southwestern Section has scheduled Arizona for 1957, Southern California for 1958, northern California in 1959, Nevada 1960, southern California again in 1961.

Plan ahead

Instead of an annual meeting in Hawaii, a plan is being worked up to stimulate inspectors from all sections of the country to take vacation trips to Hawaii and when there participate in chapter meetings of the Hawaiian Chapter. President Larry Trim, noting a member in the Philippines, another in Japan, envisions the day when there will be a Pacific Section with enough membership to support it.

Partial answer

Safer trailers

Trailers and trailer courts have long been the subject of discussion at inspector meetings. The problem is recognized by the association of trailer manufacturers, which held a convention coincident with the Northwestern inspectors in Salt Lake City. A trailer book, produced by Hub Industries of Chicago, entitled "The ABC's of Electric Supply and Demand for Mobile Home Courts," was distributed to both. A technical committee of the code is now working on revisions and will include some Western inspectors on it. The California State Division of Housing already has developed rules for trailer courts.

Right in it

Gasoline pumps submerged in the gasoline itself, coming on the market and finding their way in new installations, are giving considerable alarm to electrical inspector. The pumps seem to have been approved but some reports of breakdown of the motors have given rise to fear of difficulties.

Want to extend use

Successful use by utilities of triplex cables for service drops has prompted some contractors to ask to use a four-conductor assembly for 480 v between buildings. Since this would come on customer premises, it would fall under inspector jurisdiction and so far no code provisions have been made.

Faster service

Underwriters' Laboratories is catching up on its backlog of inspection work, Curtis Welborn, president of UL, told the Southwestern Section at a luncheon meeting. The improved new facilities at Santa Clara have helped speed inspection and testing for manufacturers, and former complaints of delays should be eliminated.

What price for trade?

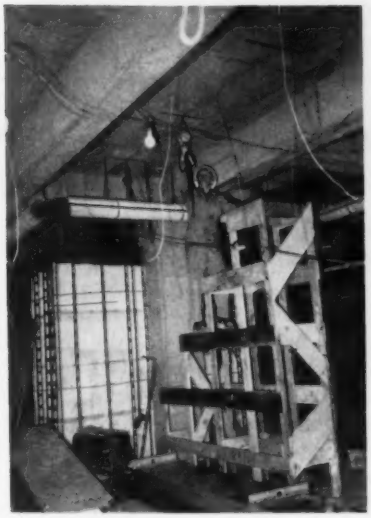
Importation of foreign-made electrical equipment, some of it sponsored by the State Department's program of encouraging foreign trade, has caused a strange situation. Used to depending upon UL as prima facie evidence of safety upon which they can depend, electrical inspectors have forbidden the installation of these foreign-made materials without an UL label. As a nonprofit, independent corporation in America, UL was reluctant to extend its scope to foreign countries. Neither did it wish to be in a position of creating a monopoly unintentionally. Merwin Brandon, well known on the West Coast, was sent to Europe to consult with manufacturers, testing laboratories, engineers there to work out some kind of program.

News of products

Some new products announced to the Southwestern Section by the exhibiting manufacturers were: BullDog—A new common-trip breaker that will be available in November. It will not be interchangeable with breakers of larger size, the inspectors were cheered to note. Also because of the trend toward 100-amp services, the panels of six and eight circuits will be bused for 100 amp . . . Harvey Hubbell Co. showed a new neoprene twist lock neoprene receptacle, made in two-, three- and four-wire polarized types, in such a way as to make it impossible to interchange the plugs . . . The Pringle switch, designed for interrupting high capacities, has been improved in many details and a 480/277 service switch is under test . . . Burndy connectors of the compression type can be used for sizes up to 2,000,000 cir mil, not only for copper but for aluminum conductors . . . Kellem grips can be used as strain relief grips on cords . . . Square D has a new Q-breaker with ambient compensation up to 120 F for use where exposed to sunlight or in boiler rooms to prevent nuisance tripping. Also to prevent substituting of higher rated breakers a plastic barrier is being incorporated . . . Crouse-Hinds—A range of fittings and devices, including lighting up to 300 w, to give approved explosionproof rating even in acetylene and hydrogen gas areas, has been announced. Likewise, a new plastic coating baked on fittings is highly resistant to corrosive atmospheres. Used on a similarly plastic-coated pipe and the joints painted with it, this coating gives remarkable protection against all corrosive conditions . . . Westinghouse announced a new 800-amp multibreaker of physically the same size as the 400 amp and new tripak combination circuit breaker and fuse . . . F. M. Anthony Co. introduced a circumferential crimping tool that takes sizes up to 500,000 cm and weighs only 2½ lb. . . . Buchanan announced new nylon insulators to go over splices made with a line of crimped fittings.

First of its type

Fluorescent street lighting in downtown San Leandro is to be dedicated Oct. 4 with a formal ceremony. The 102 standards, employing a new Line Material Co. V-type of fluorescent street-lighting unit delivering 20,000 lumens, will be turned on. Many other features are incorporated in the systems, as will be described in a future article.



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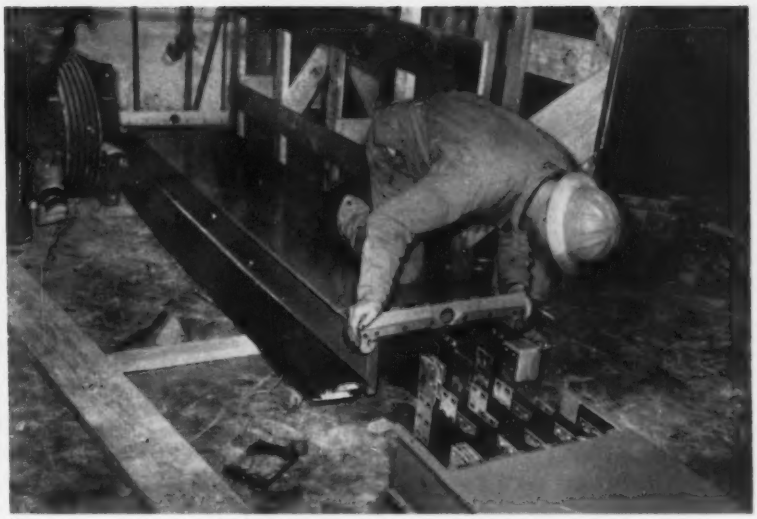

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In Equitable building the

Bus Duct Lifted by Steps

Two-stepped portable scaffolds were used by Lemoge Electric Co. in raising the heavy sections of bus duct to mount and connect them suspended from the basement ceiling of the recently completed Equitable building in San Francisco. Harry Hayes, foreman, devised the stepped scaffolds shown in the illustrations, both to support sections of duct as they were being lifted and to work from during the operation.

Steel channel was cast in the ceiling slab for the support of the duct. It was also used in the lifting operation. Picture 1 above shows placing of ratchet chain lift in a channel. Two were used. In picture 2, electrician is shown slipping bracket over end of channel on the floor. In 3, brackets in place, steel cable to the chain hoists was being fastened and cable tie between the brackets was made. Below 4, duct section being raised one step at a time at each end, the scaffold being moved under it as it reaches the successive heights. Note steps face each other. When lifted to the top, connections were made and tie-bars and channel-iron permanent supports were put in place (5). Two men usually did the job.

4

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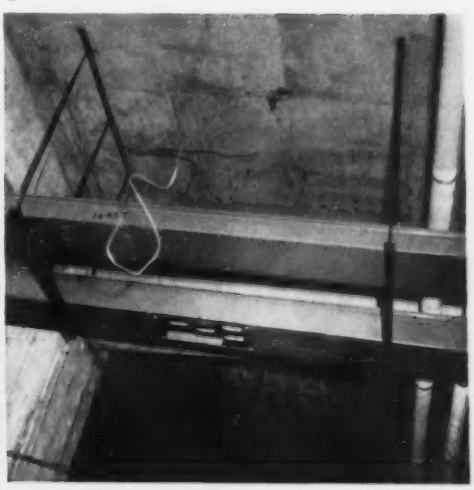


ELECTRICAL WEST

Empire Building?

PUBLIC bodies seem to have an almost irresistable urge to expand their domain and sphere of influence. The latest manifestation of this political disease is the case of the Arizona Power Authority, which is seeking to construct a state-owned 30,000-kw steam plant at Benson, Ariz. So far it has been turned down by the state certification board in a request for a quarter of a million dollars to cover preliminary studies and supervision of construction. The board, however, has approved a grant of $10,000 to study the cost and feasibility of such a power station.

The $10,000 probably will be well spent because it is difficult to figure out just why the Arizona Power Authority needs a 30,000-kw steam plant. (That body was created originally to protect the rights of cooperative power users of the Arizona allotment of Colorado River power.) It is further reliably reported that the APA has contractual rights for up to 30,000 kw of power from the Arizona Public Service Co.'s Saguaro steam plant but has never taken more than a few thousand kilowatts.

With the federal government, irrigation districts, municipalities, cooperatives and investor-owned utilities already in the power business it would seem a little farfetched for the state to get into the act, too.

Seeing Is Believing

JUST about the neatest bit of subtle selling that the industry has witnessed in a long time is the new home built by the Inland Empire Chapter of the National Electrical Contractors Assn. The chapter did not need a home, of course, but it did need a dramatic way of calling adequate wiring and the Housepower program to the attention of builders in the Inland Empire region.

The chapter did not go out and build a model electrical home on just any attractive site. It went out and purchased property right in the middle of one of Spokane's largest tract home developments. And then it built its own idea of what a really modern electrical home should be. Needless to say, prospective customers, having once seen the NECA house, may ask some embarrassing questions about the housepower capabilities of nearby homes in the tract. Best of all, the idea should be effective but not particularly expensive. There should be no difficulty in securing a buyer once the home has served its purpose of convincing prospective home buyers (and speculative builders) that wiring adequacy pays off.

Sales Incentive

CONTESTS and prizes have become a well-established factor in stimulating salesmen to reach new goals. From a relatively modest beginning, the prizes offered have grown bigger and more alluring until now vacations to Bermuda and Cadillac convertibles are commonplace rewards for top sales performance.

Keith Funston, president of the New York Stock Exchange, suggests that good common stocks also have merit as prizes for creative salesmanship. A bundle of stock certificates might not be as glamorous or half as much fun as a free 10-day trip to Hawaii for two. It would be a prize, however, that has permanence, stability and income possibilities that would have tremendous appeal to many young, hard-working salesmen. It has the added advantage of spotlighting, for the entire sales force, the advisability of investing in American industry and in many cases might start the winner off on a systematic savings program.

A hint that salesmen are not the carefree, frivolous lot so depicted by the cartoonists can be discerned from the results of a recent sales contest. Winners were given alternative choices of prizes including a trip to the factory. This latter choice was made by a majority of the winners. Asked why, most reported that they wanted to see the products made so that they would have more knowledge and confidence to help them with their presentations to customers.

EDITORIAL VIEWS

Sales contests are good. They get results. Perhaps they would be even more productive if, in selecting the prizes, management would give consideration to rewards that would help the salesman grow. A share in the company, or a trip to the factory, or a management short course at some university could be very appealing to the go-getters, the salesmen who win contests and the men on whom industry management will have to rely in the future.

Educational Leadership

THE West can well be proud of the recognition that has been accorded one of its leading educators and engineers. At the fall general meeting of the AIEE Dr. F. E. Terman, dean of the school of engineering at Stanford University, was honored as the first recipient of the Member-for-Life Medal from the institute. This award will be given annually in the future to an outstanding leader in the field of engineering education.

Dr. Terman's selection for the award was a happy one. Few men in the whole history of electrical engineering can match the contributions that he has made both to technology and to the educational structure of the engineering profession. No better evidence of his suitability as the recipient of the Member-for-Life Medal is needed than the thoughts on engineering education he expressed in accepting the award.

Therein he called upon the electrical engineering profession to recognize that today's complex technologies call for a life-long educational program to keep the individual engineer abreast of the rapidly expanding fields of knowledge. He stated that the young electrical engineer cannot achieve his full potentialities unless ways and means are found of extending his formal training far beyond the bachelor's degree. He called upon engineering educators to recognize that the student's time and the undergraduate curriculum is so precious that none of it should be wasted on knowledge that can be gained later on the job or in acquiring skills that may soon become obsolete. He asked that more attention be focused on the basic principles that will be useful and important over the years and that thought be given to arranging undergraduate engineering curriculum so that the student can fit his personal characteristics to it rather than be forced into a predetermined mold.

Dr. Terman bases his recommendations on the simple fact that, although the world and its technologies are becoming increasingly more complicated, man today is no more capable of learning than were his parents. Consequently ways must be found to teach more material as well as material of much greater difficulty to essentially the same kind of minds. He inferred that the present four-year curricula must be very carefully organized to possess a basic core of fundamentals that are common to, and would be useful in, the acquirement of further knowledge and professional skills in any of the highly specialized areas of the electrical engineering profession.

The industry needs more of this kind of thinking and more of the same type of leadership that has brought Dr. Terman this well-merited recognition.

IF IT is argued that the government should be in the power business because it can borrow money at lower rates than the power companies, the same reasoning holds true for government operation of all other businesses. Obviously the result is a system wholly foreign to the American system. In the case of TVA, what is happening is that the people of 47 states are chipping in to pay the carrying charges on a plant to serve a favored area—carrying charges that ought to be reflected in the rates charged, as they are elsewhere, and paid by the people who receive the service.—Edwin Vennard, managing director, EEI, before the annual convention of the Northwest Electric Light & Power Assn., Gearhart, Ore., Sept. 5, 1956.

Portland Electri-Living home, open to the public until Oct. 6, is one of a number of projects through the West in which the industry is helping to prove again that . . .

Built-in electrical appliances give Portland home a wife-saving, push-button kitchen

Seeing Is Believing

Because one of the best ways to tell is to *show,* model homes are being used throughout the West to point up the advantages of electrical living. The entire industry is cooperating in these showings to convince Mr. and Mrs. America that modern electric appliances and adequate wiring have benefits for them.

Two of these model home projects are pictured on these pages. The Selectric home at Spokane, opened by Inland Empire Chapter, National Electrical Contractors Assn., on Sept. 2, was designed as a model for public and contractor alike. Portland's Electri-Living home, opened for inspection on Sept. 9, is sponsored jointly by Portland General Electric Co. and the magazine, *Living for Young Homemakers.*

Electri-Living at Portland

One of 23 Electri-Living homes throughout the United States, the three-bedroom Portland home is located at SW 13th Ave. and Vermont St., in Woodrow Wilson Park. It was built by Jack C. Nunn Inc. and furnished by Meier & Frank Co. Walter A. Gordon was the architect.

Featured is the Sunshine Room, recently developed and promoted by PGE in the area. Balanced quantities of infrared and ultraviolet radiation provide midsummer sunshine the year around. The pull-down unit shown in the picture is used for concentrated sunbathing.

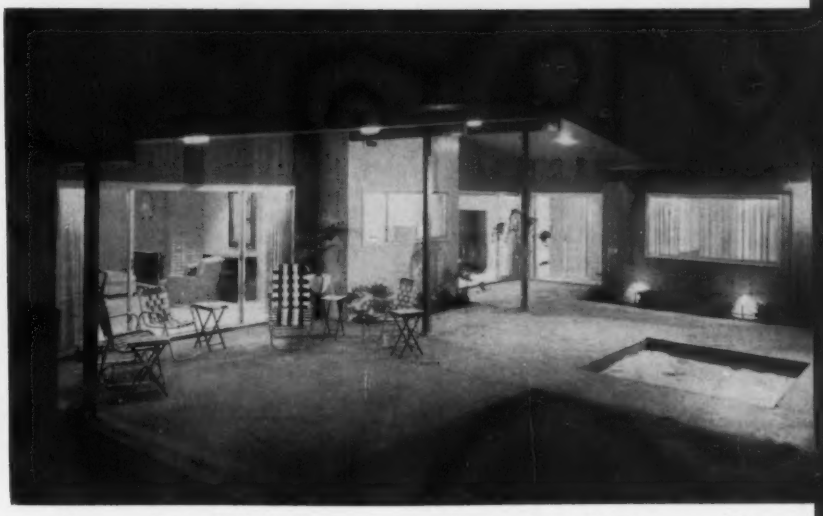
Other features are an all-electric push-button kitchen, electrically operated weather control system for heating and cooling, built-in fire alarm system, complete intercommunication, ventilating fans with automatic time-lapse cut-off switches, fenced-in fully lighted patio and all-electric utility room.

A master panel in the bedroom controls electrical circuits throughout the house. Lighting intensity is controlled by dimmers.

Family area, dining room and kitchen adjoins for ease of living in Portland's model home

Selectric at Spokane

Located in northwest Spokane at Belt and LaCrosse Streets, the Selectric home was built by the contractors association to show that what might be left for tomorrow can be accomplished today at no more expense than ordinary home building. According to Robert L. Wilkinson, NECA chapter manager, the three-bedroom, $27,000 ranch-type home has three purposes: (1) to show the public what can be done with electrical installations they can afford; (2) to provide a show place for modern wiring and utilities; (3) to renew contractor interest in

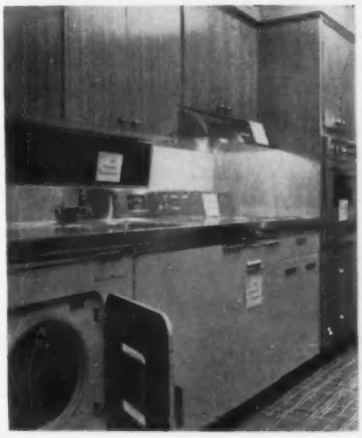


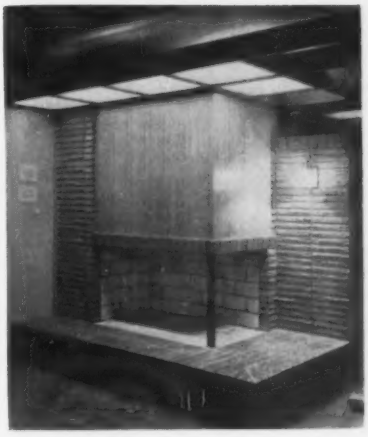
The PGE-designed Sunshine Room (left) makes it midsummer all year. Lighting is decorative as well as functional as in patio area, right

residential wiring by showing them what can be done electrically.

While it has a few gimmicks for added interest, the home does not contain a collection of custom-made electric gadgets. It is rather an application of mass-market ideas. The devices are things people can put in their new homes or include in remodeling jobs.

Approximately 4% of the cost is for





NECA's Selectric home in Spokane, below and at right, was designed as a model for public and contractors. All-electric features in kitchen are labeled and numbered for explanation in brochure given all viewers. Equal care was taken to explain lighting and wiring features in this attractive home

wiring in most homes today. Twenty-nine per cent of the cost of building the Selectric home went into electrical features, partly to show the public that modern electrical conveniences do not put the cost of a home out of reach and partly to show contractors who have deserted the home wiring field that a good selling job can mean profitable re-entry into residential contracts.

The NECA show house grew from a talk session among contractors about new ways to show off their work. A committee was appointed by the Inland Empire Chapter to sift suggestions for an all-electric house.

William James, Spokane architect, was asked to draw a medium-price contemporary home. It was then fitted with the conveniences the average family can afford—perhaps not all at once but in time. Washington Water Power Co. cooperated in planning the home and Harold U. Wright, WWP electric home planner, diagrammed the wiring.

In order to secure realistic cost data, NECA called bids on construction and wiring, and bought all electrical equipment and appliances at list prices. Electrical contract went to Rod's Electric of Spokane.

The Selectric home has a 200-amp service entrance with a 40-circuit box, 15 circuits for heating. It has 77 lighting fixtures with 51 fluorescent tubes and 57 lamp bulbs for a total of 4,355 w. There are 12,500 ft of wire of various sizes, including cable heating in the ceiling of all rooms but kitchen and bath, which have wall and baseboard units. Installed capacity of the heating system is 17,980 w.

Washington Water Power plans to submeter the heating cable when the house is sold to gage costs. Wilkinson believes the electric installation may run slightly higher per year than an automatic oil furnace but points out that there will be no cleaning or repair bills.

The home has dimmer controls in the dining and living areas and in the master bedroom. "We had to compromise on lighting fixtures," Wright stated. The 2x2-ft domino fixtures were used as a kind of luminous ceiling, he explained. Luminous ceilings are the next big step in home lighting, Wright believes, but right now they seem to be out of reach of the ordinary home buyer, he says.

Washington Water Power Co. financed the advertising for the home and utility representatives are showing it during the two months it will be open for inspection. Appliance manufacturers underwrote a four-page brochure listing features and providing a keyed diagram. A copy is given to each person who visits the home.

Utility finds benefits in

Cooking Schools for Men

FOR men only. This was the rule for a series of cooking schools put on by Western Colorado Power Co. for employees, dealers and their salesmen, FFA boys, high school seniors and members of rural organizations.

But even if they were for men only the schools benefited men and women alike. They also paid off for the utility and the industry in sales of appliances.

Commenting on the program, Hazel Vance, company home economist, explained that the idea for the program came to her after a long period of listening to the women attending regular cooking schools. Repeatedly these women commented: "My husband should have been here to see this range demonstration," or "It is my husband who has to be sold on this appliance."

The schools were held in grange and community halls, the utility's hospitality rooms and in high school home-making rooms. With the exception of boys' classes, all meetings were held in the evening.

Major electrical appliances and housewares were used and demonstrated, with instructions on proper care. Home lighting was discussed at some meetings and adequate wiring was stressed in every instance.

Demonstrations were generally of the group-participating type with this basic pattern:

1. The appliance used was completely discussed and its care and operation was explained.
2. The cooking operations were started (in a freezer demonstration, food was properly prepared and wrapped).
3. A question and answer period was introduced.
4. The prepared foods were served and an informal discussion followed.

The men helped serve the meal and placed the dishes in the dishwasher on completion of the meal. Invitation to inspect the equipment was always accepted, Miss Vance said.

A typical meal consisted of a skillet dish (or a broiler meal) fresh or frozen vegetables, cake or pastry, rolls and coffee.

Promotion of the project was by radio, newspaper and trailer announcements in motion picture theaters. Announcement at organization meetings, however, was the major promotion plan.

A total of 751 men and boys attended 26 classes. While there were very real, if intangible, benefits in the greater interest in electrical appliances shown by men who attended the classes, there was a tangible load-building benefit. Here are the appliances sold as a direct result of the classes: 12 home freezers; 10 electric ranges; 6 refrigerators with freezing compartment; 2 dishwashers; 6 automatic laundry units.

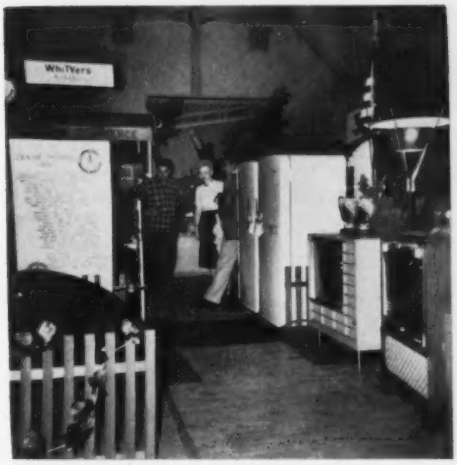
Miss Vance varied her approach with the group. At the schools for appliance dealers and salesmen, she approached the use and care of appliances from the viewpoint of their potential customers—housewives. These men already had been given training on the mechanical construction and operation of the merchandise they sold but all too often the women's viewpoint had been overlooked in their sales classes. Miss Vance told them frankly that many requests for assistance from dissatisfied buyers could be charged against lack of instruction by the salesman at the time of sale and installation. Among the information given this group were hints on foods suitable for freezing, on use of the range, on detergents.

For rural organizations, demonstrations were planned wherever possible, around the products grown by the members of the group. Farmers traveled as far as 30 miles to attend these meetings and attendance ranged from 18 to 42. These men already knew the convenience of electricity for farm operations. The schools were planned to point out benefits of modern electrical equipment for the home.

For company employees, demonstrations were held on the range, freezer and small appliances. Other appliances were discussed carefully. In the Montrose district, demonstrations were held in the power company auditorium immediately after the monthly safety meeting, with clerks, metermen, business development men, plant personnel and management joining the group. In Durango the meetings were held at the close of the work day.

Demonstrations to high school boys led to a request from FFA leaders to hold similar schools for their members. These classes differed from other Schools for Men in that the boys showed a vital interest in the construction and mechanics of the equipment—facts known to the other groups through their regular training.

Adequate wiring for efficient operation of appliances was stressed at these boys' classes as it was for the adults.



Colored appliances and color TV were key attractions in Contra Costa Appliance Dealers' Antioch fair exhibit, first winner in its class

Industry cooperates with dealers in

Prize-Winning Fair Exhibit

When the Contra Costa Appliance Assn. planned its exhibit for the 1956 county fair at Antioch, Calif., it decided to get away from the warehouse appearance; to show a few appliances in attractive surroundings, suggesting their home use. That this idea paid off is evidenced by two results: (1) the exhibit was well attended; (2) it won first award in the commercial classification.

Sponsored by the appliance association with Northern California Electrical Bureau, the Gas Appliance Society and Pacific Gas and Electric Co., the display took up 900 sq ft at the front of the exhibit area. Eleven cooperating dealers had individual spaces divided by low redwood fences to give the effect of one coordinated display. Emphasis in planning was on initial impact and therefore there were no booth obstructions. Greens, plants and shrubs were combined with the attractive fences, post and garden lights to give a pleasing over-all appearance.

Exhibiting dealers were encouraged to show colored appliances and to limit them to one of a kind. Color TV also was emphasized.

Audience for this exhibit was good since the Contract Costa Fair this year drew record attendance, some 33,000 people. New concession booths, grandstand space and horsebarns were added this year and a $1,000,000 parade inaugurated the four-day event.

Ivan Whitver is president of the Contra Costa Appliance Assn. Working with dealers on the exhibit were PG and E division staff members, including Leo M. Kass, field supervisor, dealer and sales promotion, and dealer representatives, George Schutz, fair and exhibits, Jerry Gajarian, secretary and treasurer of the association, William Rockett.

Fair trophy is displayed by George W. Schutz, PG and E sales representative. With him are Ivan Whitver, president of the Contra Costa Appliance Assn. (left), and Garo H. Gajarian, secretary-treasurer

A part of the fair, though not associated with the dealer exhibit, was PG and E's contest for 4H Club members. Teams of two competed in preparing entire meals, including table setting. Judging was on a point system by an impartial jury. Prizes were small electric appliances: a mixer and juicer, skillet and steam iron. PG and E's Esther Day is shown, right, with 4H group

Naughton
Utah P & L

Setterstrom
Montana Power

Kimball
Idaho Power

Expanded activities and vigorous programs promised for the coming year at . . .

49th NELPA Conclave

Dunning
N. W. Ayer & Son

Winsborough
Middle West Service Co.

• New areas of service to the industry and stronger, more stimulating sectional programs are listed as top priority objectives of the Northwest Electric Light & Power Assn. next year. The program of that group's 49th annual convention, held at Gearhart, Ore., early last month reflected new vitality in association activities and stressed intraindustry cooperation at all levels and between all segments and branches.

E. M. Naughton, president of Utah Power & Light and newly elected president of the association, blueprinted his administration's program in an opening address before the meeting. He called upon the association to promote progress of the electrical industry so that the public can be better served. Naughton stated that the basic policies for the entire electrical industry are well established by its strong national associations and that vigorous promotion of these policies at the regional and local level is a major factor in the strength and growth of the entire electrical industry.

According to the new president, there is room for improvement in the development and presentation of sectional programs. He stressed the need for better preparation by the speakers and a more thoughtful consideration of the general program content to the end that the sectional meetings could be made more stimulating and valuable. Subjects embracing long-range problems and broad-gaged ideas, instead of detailed descriptions of procedures, would give sectional programs a broad appeal to all members of the industry. In that connection, Naughton suggested that the utilities should work more closely with allied segments of the industry, particularly with local electrical industry organizations. In this latter activity, of course, the Northwest Electric Light & Power Assn. could be a focal point for such activities.

John T. Kimball, Idaho Power's vice-president and general manager and newly elected first vice-president of the association, described the future as being one of larger responsibilities for the association's activities. Paramount among these are the need to find ways and means of interesting young engineers in the challenge of the 60-cycle field, to improve customer relations, particularly through employee relations and employee education, and to emphasize to each individual in the electrical industry the tremendous opportunities for personal growth and development in this dynamic and expanding segment of the American economy.

Kimball also suggested that the utilities might well take a leaf from the manufacturers by embarking on

Gilbert
Idaho Power

Gordan
PGE

Steede
B. C. Electric

Ilch
Idaho Power

research programs of their own. Common problems, ranging from determining customer attitudes to equipment performance, offer fruitful fields for investigation by the electric companies working in concert through the association.

The investor-owned electric utilities of the Pacific Northwest have accepted the challenge of "bigness" in the river basin development of that area. This was the statement of Thomas Delzell, chairman of the board of the Portland General Electric Co. He also told the meeting that the Pacific Northwest region needed nearly a million dollars a day in new plant investment to meet its projected growth demands. Expressed in another way, the area needs new plant capacity equal to the 500,000-kw Bonneville plant every year.

This construction program is so large that even the federal government has been unable to satisfy the needs for additional capacity. Partnership policies have enabled other agencies to augment the developmental work of the federal government to the point where adequate power supplies seem assured. New hydro stations totaling 7,300,000 kw have either been started or are under consideration. Of this amount, the investor-owned utilities are developing 3,000,000 kw with smaller, but substantial, commitments also being made by the Northwest municipal systems and PUDs. These plants when completed will nearly double the present capacity of the region.

Delzell also pointed out that hydro will remain the power energy base for the region for the next 10 or 15 years while the last of the economic hydraulic sites are developed. Thereafter conventional steam plants or atomic stations will begin to assume base load responsibilities.

Prominent Eastern Speakers

Four of the industry's top executives nationally presented as many thought-provoking addresses to the convention. EEI's new managing director, Edwin Vennard, praised the staunch stand that has been taken by the NELPA members to preserve free enterprise in the electric utility industry. He pointed out that the growth of government power has continued largely because of a lack of understanding of basic issues by the people.

"People who are informed as to the principles of the free enterprise system and the basis of political and economic freedom on which it is founded, tend to favor it and to oppose social-

Ingledow
B. C. Electric

Vennard
Edison Electric Institute

Barnett
Nat. Assn. Elec. Cos.

Delzell PGE | **Alger** PSP&L | **Radford** Utah P&L

Cutter
Federal Pacific

Snow
NELPA

Thrailkill
WWP

ism," he said. Urging the industry to concentrate on telling the story of American freedom, Vennard warned that if ignorance, misconceptions and misunderstandings of the basic issue of economic freedom persists not only the power industry but all free institutions will gradually be taken over by the government.

The effects of one phase of the public information program were dramatically described by E. R. Dunning, vice-president, N. W. Ayer & Son Inc., who supervises the Electric Companies' Advertising Program. ECAP's advertising series began in 1941 when public attitude surveys indicated that only 37% of the people were favorable to investor-owned electric utilities. Since that time, according to Dunning, the program has evolved into what might be termed the national voice of the investor-owned electric companies. As such it is one important phase of the industry's over-all public relations program which, in the past 15 years, has brought about a complete reversal of the public attitude expressed prior to World War II.

Dunning emphasized the ECAP's activities provide a national climate favorable for more effective results from local public relations efforts.

Robb M. Winsborough of the Middle West Service Co. of Chicago expanded on the public relations theme, stating that public relations problems may exceed technical problems in the future. He described the motivations through which people base their opinions and he suggested that all company activities should be scrutinized to insure that they conform to the well-recognized factors that govern people's attitudes.

A continuous program of employee information and education is an essential ingredient in any public relations program. This in turn necessitates a continuous supervisory training program to accomplish the former objective. Winsborough urged that these programs be carried on on company time and pointed out that, although they involve considerable effort and attention on the part of top management, they provide many by-product dividends other than improved public relations.

Arthur Barnett, managing director of the National Association of Electric Companies, reviewed the legislative activities of the 84th Congress with respect to electric power. He also praised the industry leaders in the Northwest for the part they have played in the formulation of partnership power policies during the past three years.

New Officers

R. C. Setterstrom of the Montana Power Co. stepped down from the presidency of the association after a two-year term during which many of the policies enunciated at the annual convention were formulated. In turning the gavel over to his successor, E. M. Naughton, he told the convention that he felt that the association should become the rallying point for free enterprise in the Northwest. He proposed that more use be made of the talents of the top executives of the industry in working with other business groups to preserve the benefits of economic and political freedom.

To the post of second vice-president of the association, made vacant when Kimball was elected first vice-president, the convention elected T. Ingledow, vice-president and chief engineer of the British Columbia Electric Co.

Naughton appointed M. M. Ilch, Idaho Power Co., as chairman of the Accounting and Business Practice Section; and A. S. Gilbert of Idaho Power Co. as chairman of the Business Development Section.

Berkeley Snow, retiring executive manager of the association, was cited for his long years of service on behalf of the electrical industry in the Northwest. The utility members of NELPA presented Mr. Snow and his wife with an all-electric kitchen for his new home at Arch Cape, Ore., so that "he could take electrical living into retirement with him." Snow's successor as executive manager will be announced in the near future.

The convention was also given a preview of a new Housepower film entitled "Loaded Wires" produced by the Federal Pacific Electric Co. The film, in a humorous but effective technicolor presentation, tells what happens to the typical family when expediency is substituted for good judgment in trying to make an overworked wiring system work still harder. The film, incidentally, will be made available on loan for use with luncheon clubs, associations and other civic gatherings.

Code panel: Gaffney, Watson, Travis, Smith, Watts (moderator), Brandon, Volheye, Gray. Awaiting the 1956 NECode . . .

NW Inspectors Mark Time

Nothing hotly controversial disturbed the orderly proceedings of the 30th annual meeting of the Northwestern Section, International Association of Electrical Inspectors, in Salt Lake City, Sept. 10 to 12. Even the paper on residential service demand (see p 119 of September issue) presented by Jack Reeves, Spokane consulting electrical engineer, aroused interest but not controversy.

Perhaps the absence of copies of the new 1956 National Electrical Code inhibited code discussion. Promised for the meeting, copies had not yet come from the presses and only a pamphlet from NEMA listing the changes was available.

However, in preface to his explanation of some of the more important changes, Merwin W. Brandon, chairman of the code correlating committee, gave an inspired message on the importance of the democratic processes by which the code is formulated.

After a trip to Europe for Underwriters' Laboratories of which he is vice-president, to work out means for inspection of foreign-made products that the State Department feels should have a market in this country, Brandon reported his reactions. The people, he said, were fine and very little different from their same nationalities now merged into Americans. The engineers he found excellent, installations expertly made, manufacturing facilities (many provided with American equipment and know-how) equal to any in this country.

But the hindering difference was the class system, he said, which prevented those with initiative from making any progress. And the customs barriers and government regulations made trade and commerce almost impossible.

He drew a parallel as a warning of what could happen in America if every city and state set up its own regulations and codes instead of working constantly for a national code. "We would have a situation here in which a manufacturer just couldn't produce and market under all the restrictions," he warned.

Importance of the electrical inspector to the industry was emphasized by Larry O. Trim, Burbank chief inspector, who is international president of IAEI. In reviewing the association's activities and problems, Trim declared:

"The entire electrical industry depends upon the electrical inspector to accept or reject, knowing very well that, by rejecting, it is usually not the fault of any specific material or device but commonly the way it is being installed. Many manufacturers depend and act on the comments of the inspector for the design and improvements of their products. Of course, there are those who condemn us because, in their words, we deny them the rights and privileges of free enterprise, when all we do is refuse and in some cases prosecute them for attempting to unload on an unsuspecting public something of which we have no recognized approval, or which is considered a hazard to life and property."

Significant of the recent action in his own Southern California Chapter to consider formation of an independent inspectors association, he urged that inspectors give serious thought that "sometime in the future, the IAEI, by the strength and type of its membership, may become an independent organization and truly the 'keystone of the electrical industry.'"

He ended by urging that members of IAEI sponsor a program to give more attention and consideration to the prevention of electrical accidents.

Section President Cliff Atkins, Ore-

Morr Mayor Stewart

Gaffney Atkins

Smith Martini

Klawa Paxton

gon state inspector from Portland, commended the host Utah Chapter for adding 41 new members, almost half of his Northwest Section goal of at least 100, during the year he is president.

H. G. Ufer, honorary president of IAEI, was prevented from attending by illness in the family, and the section, in whose meetings he has been a regular participant, voted a resolution of regret.

A progress report of the Live Better-*Electrically* program in the West was made by Frank M. Falge, San Francisco, supervisor of the program for the Western area. The greater usage of electricity from appliances of higher wattages and faster performance creates problems that only more wiring can solve, he pointed out. Although legislation may not be the most desirable way to get more wiring capacity, in many cases, he said, it seems to be the only way. He spoke of the relationship between adequacy and safety as a justification for higher standards.

Information about IAEI's multitude of activities and functions was brought by Charles L. Smith, secretary-treasurer, and Everett Cogan, technical assistant secretary. They report the membership has increased to 9,000; that a directory will be published only every two years; that dates for annual meetings will be set five years in advance; that the Safe Electrical Cord committee will focus efforts on appliance and lamp makers. Smith said the trailer park situation was under study of a special committee, with Western men on it.

By coincidence, the trailer manufacturers convention was being held simultaneously and the latest standards for wiring of trailers and trailer parks were exhibited and distributed to members.

National Electric Week, initiated by Captain Sanislo of Seattle, member of the Northwestern Section, will become an annual event and organization already is under way to make the 1957 observance during the week of Feb. 10 an outstanding event.

Among the 1956 Code changes highlighted by Brandon were these:

2124-B—grounding-type receptacles will be required on porches, in garages and other locations exposed to hazard.

2203-G—no reduction will be permitted in the neutral below that of the phase conductors.

2411—fuses will be permitted in multiple for motor loads.

Cable troughs, Brandon explained, were not written into the code because many types of cable supports are not yet in the code and opinion was that the troughs could be used without specific mention.

3102—Type RHH has been officially given as a name to a wire.

3106—Tables 1a and 2a have been included to give current-carrying capacities for aluminum wire.

3342—ACV armored cable will now be permitted for use in commercial and industrial installations.

3650—attachments to busways must be branch circuit devices.

4277—clearly indicates single pole thermostats.

4291—interim amendment regarding air conditioning units was put in the code.

4542—equivalent fire resistant construction is permitted for transformer vaults.

Article 700 has been rewritten with emphasis on a performance basis.

7322—pin-type contacts not originally intended for outdoor use are permitted on outdoor lamp sockets.

7323—clearances over driveways clarified.

93101—grooves or ridges to separate fixture wire are permitted in lieu of colored conductors.

What might be considered a code discussion subject was presented by V. G. Vaughn, consulting engineer, Spencer Thermostat Division, Attleboro, Mass. He advocated elimination of the requirement for controllers that would open all ungrounded conductors in 230-v motor branch circuits.

Code questions that came up during the code problem discussions included some of the following. John Watts, former Seattle city inspector, now a contractor, was moderator, and the panel included William Gaffney, William Volheye, Joe Gray, Merwin Brandon, C. L. Smith, H. H. Watson, Beverly Travis, Chester Kirsop and Cliff Atkins.

When will the code and hence Underwriters' Laboratories recognize high-capacity fuses and circuit breakers, was asked by the inspectors. Growing problems of determining the suitability of devices to interrupt increasingly heavy commercial and industrial loads, particularly on network systems, have caused inspectors concern. Answering questions, it was stated that until more makes of such fuses were available and were interchangeable, standards could not be written. The problem has been referred back to the manufacturers for standards.

Considerable confusion regarding interpretation of hazardous areas around gasoline storage and filling stations led Volheye to suggest that the entire Article 500 be discarded as impossible and that it be completely rewritten in language that could be understood by the average inspector.

Whether ammonia dispensing stations where some slight danger of ex-

Reeves Widrig Brandon

Vaughn Sisson Gray

plosion may exist are to be classed as hazardous locations, and if so, what type? The answer given was that these have not been considered sufficiently explosive.

Is the family room to be considered a dining and kitchen room in the sense that it would be equipped with 20-amp appliance circuits on No. 12 wire? The answer given was that, regardless of what a room is called, the purpose to which it is put must determine the wiring facilities.

A request that Article 410 have an added paragraph to require means for control and disconnecting of lamps in fixtures.

Watson, chairman of the code panel now wrestling with the problem of how to wire separate range ovens and tops, asked for actual experiences of accidents or fires caused by faulty construction. Many suggestions were made regarding type of wire and provision of an outlet box in which connections could be made.

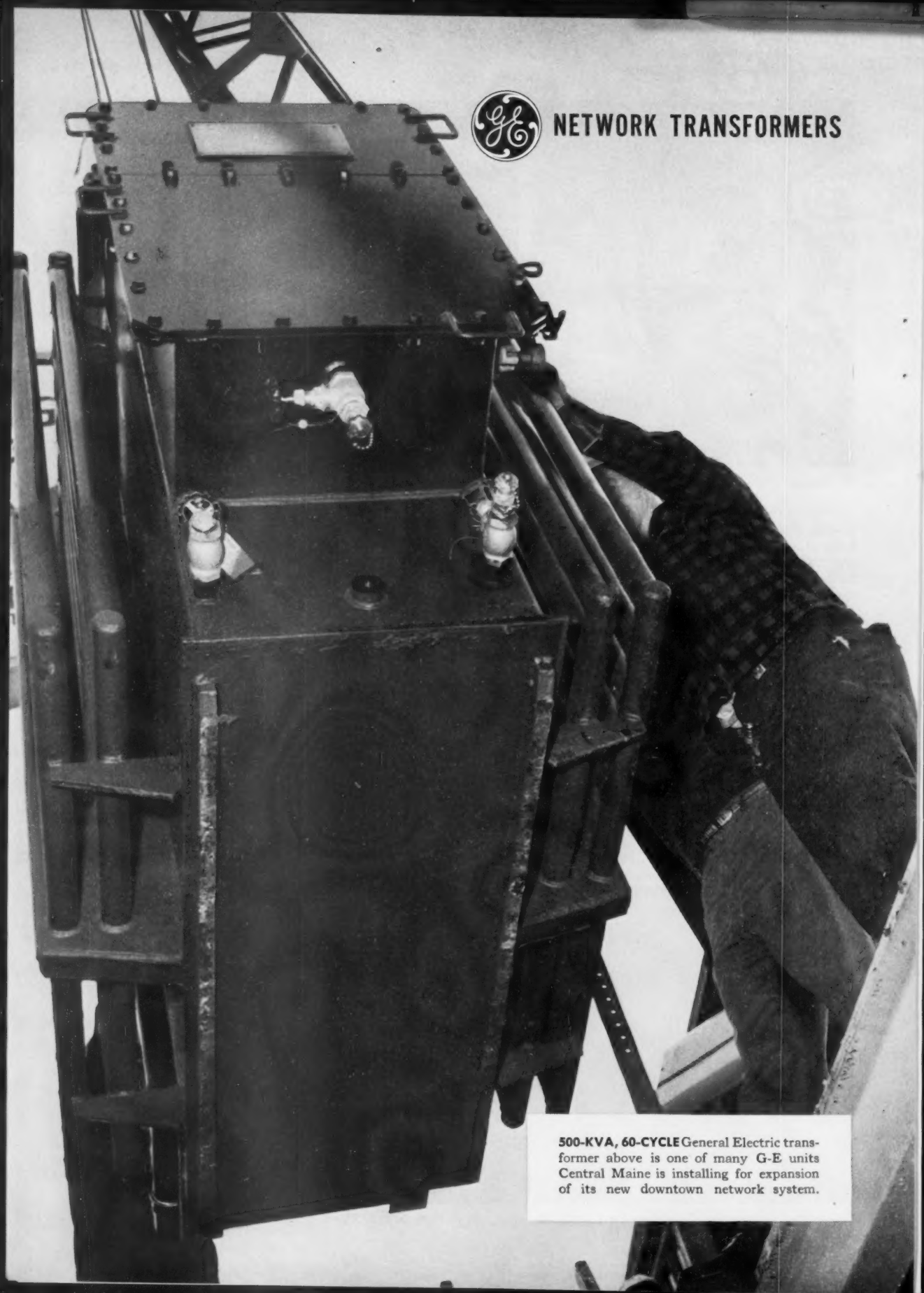
Triplex cable used by utilities for service drops has not been approved for wiring on private premises. Proposals have been made to use it for 480-v connections between buildings. A request was made for code guidance relative to permission to use such cable.

Joe Gray also requested that type S fuse classifications be changed with the first group rated at from 0 to 20 amp and the second from 21 to 30, but that the adaptors not permit interchangeability.

Other recommendations made were that plastic pipe be somewhere covered in the code.

In the election of officers that closed the meeting, H. S. Morr of Utah Fire Rating Bureau, Salt Lake City, was named president. He is currently first vice-president of the international association and will likely be president of both his section and IAEI. Other officers elected are P. H. Forte, Boise city inspector, first vice-president; James Paxton, Spokane city inspector, second vice-president; William Gaffney, Tacoma city inspector, secretary-treasurer. Executive council representatives will be Morr and Gaffney, with Atkins, retiring president, as alternate. To the executive committee there were elected J. D. Gawne, Seattle City Light; Tom Widrig, General Electric Co., Seattle; S. M. Tubbs, Bellingham city inspector; J. Hyde Stayner, Utah Power & Light Co., Salt

Oregon Chapter sent this power-packed delegation. Standing, left to right, Miller, Klawa, Sisson, Bachenstos, Baker and their chiefs



NETWORK TRANSFORMERS

500-KVA, 60-CYCLE General Electric transformer above is one of many G-E units Central Maine is installing for expansion of its new downtown network system.

Why Central Maine Converted Radial System to a Network

In downtown Portland, Maine, the Central Maine Power Company faced today's familiar problem—how best to meet the growing demand for power.

After careful investigation, Central Maine's forward-looking engineers converted the company's 4-kv radial system to an 11-kv network system, recently adding a number of General Electric transformers to expand the system. In changing to a network, Central Maine gained these advantages:

Improved regulation—Voltage drop with the new system is less than 5% in the network area even under heavy load demands, thus assuring stable voltage for consumers.

Increased dependability—With the network power lines underground, service continuity is further assured. Even though two of the 1955 hurricanes passed through Portland, the network system continued to supply power to doctors, local government offices, and other vital services in the center of town.

Best possible service for customers. With load increasing fast on the old radial system, unscheduled outages, breaker operation, and fuse blowing could have become a source of concern. The new network system helped assure continuity by eliminating the cause of such troubles.

FOR HELP IN PLANNING YOUR SYSTEM

Today's General Electric network transformers are the culmination of more than 30 years' experience in building transformers for network service.

G-E network transformers installed on your system now, allow you to meet increased current demands. When expansion is needed in the future, you have the start for a network system.

For information on G-E network transformers, and for help in planning your network system, call the nearest G-E Sales Office. Or write for Bulletin GET-2432. General Electric Company, Section 435-12, Schenectady 5, N. Y.

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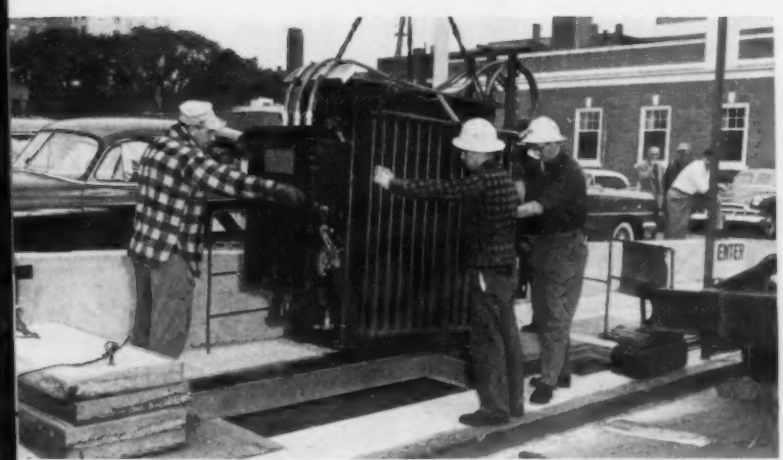
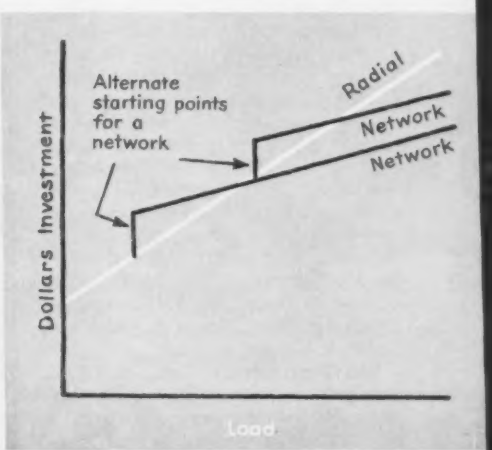
GENERAL ELECTRIC

With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.



EASY TO INSTALL, G-E transformers were connected without interrupting service. Central Maine Company men connected cable terminations in their service shop to further simplify installation.



IT COSTS more to increase capacity by changing to a network than by expanding a radial system. But future increases cost less with the network.

Lake; and Joe Gray, Portland city inspector.

The next annual meeting will be held in Spokane Sept. 9, 10 and 11, 1957.

High praise was given the hosts, the electrical industry of Utah, for the trout dinner at Brighton, the banquet entertainment, the organ recital at LDS tabernacle and the excellent arrangements for all facilities. Morr headed the annual meeting committee, with L. B. Johnson in charge of program; A. H. Bywater, finance; J. H. Stayner, hotel and housing; Amos Bronson, entertainment; W. A. Huckins Jr., exhibits; R. K. Williams, registration; Bernice Bywater, ladies' activities; H. R. Schoepf, transportation; L. M. Christensen, publicity; and L. E. Baty, photographs.

PCEA Schedule

Conference and convention schedule for PCEA's current year:

Administrative Services Section: Nov. 14-15, 1956, Hotel Biltmore, Santa Barbara; April 24-25, Hotel La Playa, Carmel.

Business Development Section: Feb. 28-March 1, Sheraton-Palace Hotel, San Francisco.

Engineering and Operating Section: March 21-22, Hotel Statler, Los Angeles.

Annual Convention: May 15-17, Fairmont Hotel, San Francisco.

Hawaiian Conference: Nov. 7-8, 1957, Reef Hotel, Honolulu.

Electric Clubs

Old-timers' Day at the San Francisco Electric Club's first meeting of the new season brought on a nostalgic mood and a re-enactment of the 1906 fire. Honored at the affair were Electric Club members who have been in the electrical industry since 1906 and are members of the Half-Century Club. Each of the old-timers was called on to volunteer for fire fighting. Amidst the color of a simulated fire and the clangor and wail of bells and sirens, the old-timers received certificates and fire-fighting helmets, and well-deserved applause from fellow members. Old-timers honored were: C. W. Burchett, Donald I. Cone, Charles A. Dostal, Bill L'Hommedieu, Edward J. Riley, Walter B. Smith and Noble A. Wright.

San Diego Electric Club heard R. L. Cole of Westinghouse on a recent program. He told the story of Cypack, a new industrial control system composed of static switching circuits.

Los Angeles Electric Club started its 36th season with a luncheon meeting on Sept. 17. George Larsen, Larsen-Hogue Electric, is president.

Standing proudly with a brand new Illuminating Engineering Society charter, formally made effective at Calgary, Alberta, recently, are Bob Underhill, manager of membership committee of the new Chinook Chapter; Joe Thomas, IES Canadian regional vice-president; Don Little, secretary of Chinook Chapter; Blair Plowman, IES Pacific Northwest regional vice-president; Don Frost, Chinook chairman; Gerry Woods, educational committee manager of the new chapter; Martin Vickers and Bob Mason, positions not reported

Chinook Chapter, IES,

Holds Charter Meeting

Chinook Chapter, Illuminating Engineering Society, at Calgary, Alberta, Canada, was recently launched with appropriate fanfare and ceremony.

The charter meeting of the neophyte chapter was telecast locally, and Blair Plowman, regional IES vice-president from Spokane, and Joe Thomas, Canadian regional vice-president, Montreal, were interviewed by a Calgary radio station for its "Talk of the Town" program.

Chapter members with their wives and guests attended a banquet at Calgary's new municipal airport, reported to be the most modern in Canada, and had dinner before a splendid view of the Canadian Rockies and Alberta Foothills.

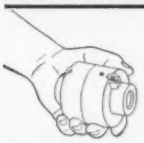
Charter presentation was made by Blair Plowman, who was accompanied to the meeting by Mrs. Plowman.

Other guests included B. C. B. Jarvis, chairman of the Edmonton chapter, Mrs. Jarvis, Fred Dorward, Alberta IES representative, and Mrs. Dorward. The chapter received many congratulatory telegrams during the evening from IES chapters and national officers. Honored guests at the banquet were Mayor Don McKay, Calgary, and Mrs. McKay.

Officers of the new chapter are: Don Frost, chairman; Bob Underhill, manager of membership committee; Don Little, secretary; Gerry Woods, manager of educational committee; and Martin Vickers and Bob Mason.

Chinook Chapter's charter banquet was held at Calgary's colorful, new municipal airport

POLYPHASE METERING:



Current transformers provide built-in adaptability for future load growth

When polyphase loads go over 100 amperes—it's time to install Sangamo Type R Current Transformers. Their unique adaptability encourages simple economical installations that eliminate the need for larger self-contained meters which have only limited capacity for still further expansion.

Sangamo Type R Transformers can be used as bar-primary-types or window-types, with or without auxiliary mounting plates, and are light enough to be fully supported by the primary conductor.

Available in 200 and 400 ampere ratings, in eight variations that permit almost any primary arrangement.

Ask your Sangamo Representative, or write us for Bulletins 501 and 150 for detailed information on Type R Transformers and mounting racks.

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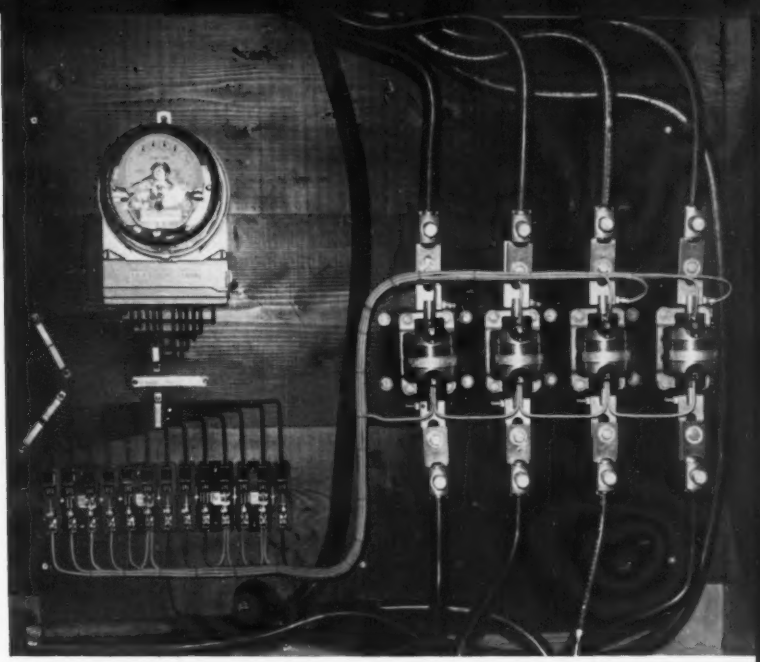
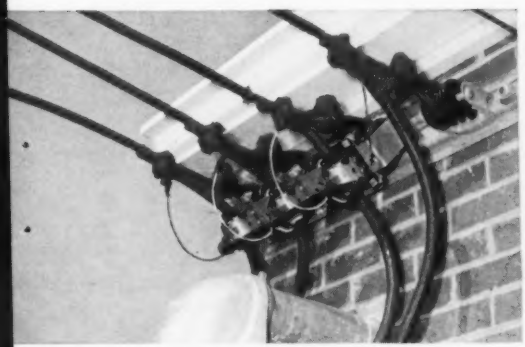
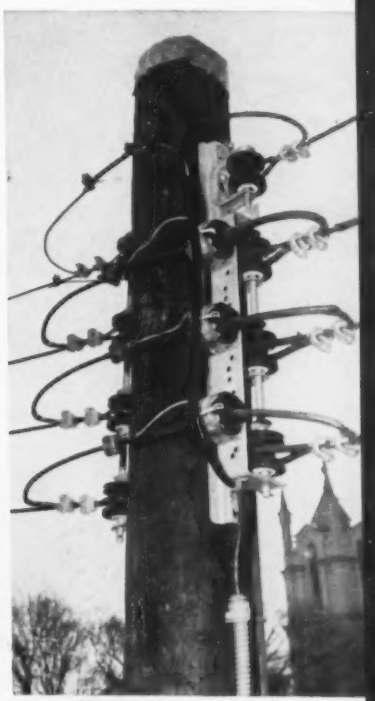


Meter Box Installation measuring 3-wire three-phase and 3-wire single-phase from separate sources on one meter using four Type RF-6A Sangamo Current Transformers.



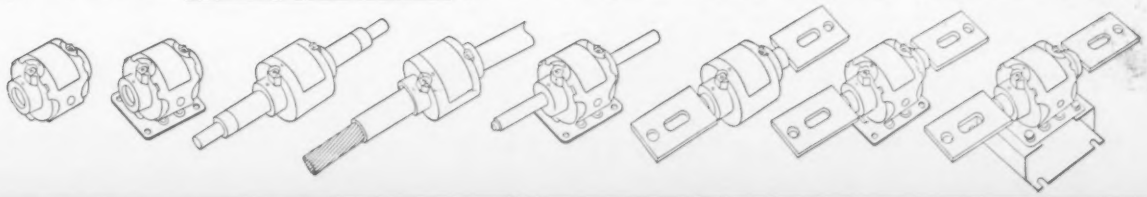
Three Type RC-6A Current Transformers are supported on a horizontal secondary wire Sangamo Transrack.

Service entrance mast installation with three Sangamo Type RC-6A Transformers mounted on a Transrack supported by the grounded neutral.



This pole-top installation shows three Sangamo R-6 Current Transformers supported by the secondary rack.

Eight variations of ONE BASIC TRANSFORMER permit the engineer to devise many other economical installations.



SMSS-8

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Electro-Mobile Power, such as this Commonwealth Edison unit, puts a fully automatic source of added capacity into regular peak-skimming service, and is constantly ready with substantial stand-by power for emergencies.

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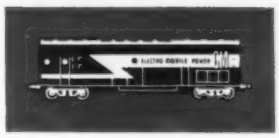

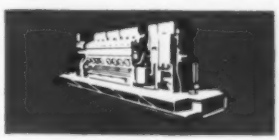

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If the safe and efficient functioning of your electrical systems—in any type location—is a problem, then Youngstown "Buckeye" full-weight rigid steel conduit should be your specification. Field reports state: "It's easier to bend—easier to fish wires through and due to its superior corrosion resistance, affords a much longer service life."

Leading architects, owners and contractors have made "Buckeye" Conduit their standard because they've found its use increases both profits and customer satisfaction.

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Ask your distributor for Youngstown Buckeye Full Weight Rigid Steel Conduit and Youngstown Electrical Metallic Tubing.

THIS MONTH'S NEWS

Klickitat PUD to File For John Day License

Klickitat County PUD (Wash.), serving about 5,100 customers, has announced intent to file an application for a preliminary permit to study feasibility of developing the 1,105,000-kw John Day project.

John Day construction has already been authorized by Congress, and the Corps of Engineers recently announced that a site has been selected.

The PUD action is being started in the face of a partnership proposal by Pacific Power & Light, Portland General Electric and Washington Water Power to advance $273,000,000 (88% of project cost) in exchange for a 50-year electric delivery contract.

L. E. Darland, president of the PUD, said: "The filing of this application is intended to insure control of this great natural resource by public interests if the federal government continues to take the position that such projects should be built by local rather than national agencies."

Darland said the PUD (which could use only a fraction of the power) would market power through the Northwest Power Pool. The plan would probably follow a pattern established by the Grant County PUD in developing the Priest Rapids project.

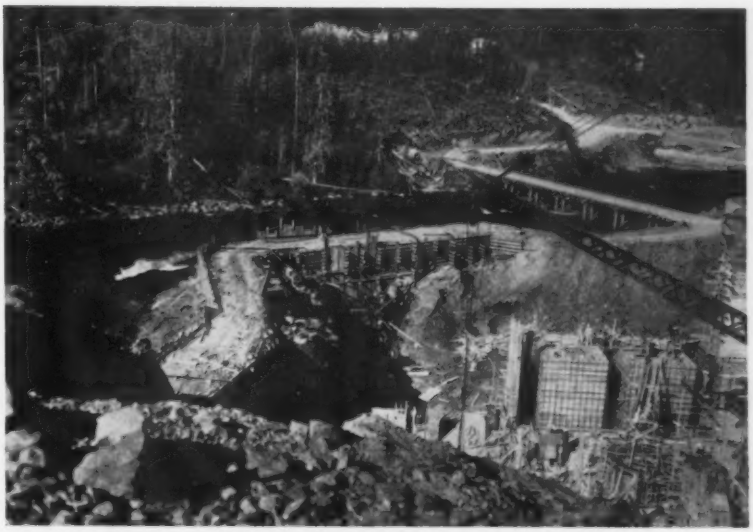
Opposition Develops Against Agency Plant

Arizona Power Authority is finding its proposal to construct a 30,000-kw steam-electric generating station has become a political issue in state-wide electioneering.

The authority is a state agency set up to contract with the U. S. government for purchase and distribution of hydroelectric power from the Colorado River. With engineers forecasting a 25% cut in the power supply from the Colorado River, the authority has proposed a generating station near Benson.

The plan is being brought into the political picture by O. D. Miller, Republican candidate for governor, who says the proposal "however harmless it may appear on the surface" would be an approach to state socialism.

Other opposition is stated by Phoenix newspapers.



Ladore Falls project of British Columbia Power Commission is nearing completion, and is going to be tied in with the Upper Campbell development. From the existing storage dam at Ladore at the outlet of Lower Campbell Lake, water will be diverted through a 2,000-ft, 22-ft diameter, lined tunnel. The water will drive two 35,000-hp generators. Northern Construction and J. W. Stewart, builders, are supposed to finish the job soon

Northwest Power Pool Adds Big Power Source

Arrangements were completed Sept. 7 for linking public and private power systems of Colorado, Wyoming and western Nebraska with the Pacific Northwest Power Pool, effective Oct. 15.

Harold R. Lee, Denver, regional power supervisor for the Bureau of Reclamation, said the three-state power pool of 1,000,000 kw would be linked with the Northwest Pool at Billings, Mont. The Northwest Power Pool has 7,500,000 kw in operation and 2,000,000 kw in the construction stage.

Linking the two systems was worked out by 35 top executives, engineers and technical experts of the Bureau of Reclamation, Public Service Co. of Colorado, Montana Power Co., Pacific Power & Light Co., Consumers Public Power District of Nebraska and Cheyenne Light, Fuel & Power Co.

E. Robert de Luccia, vice-president and chief engineer of Pacific Power said:

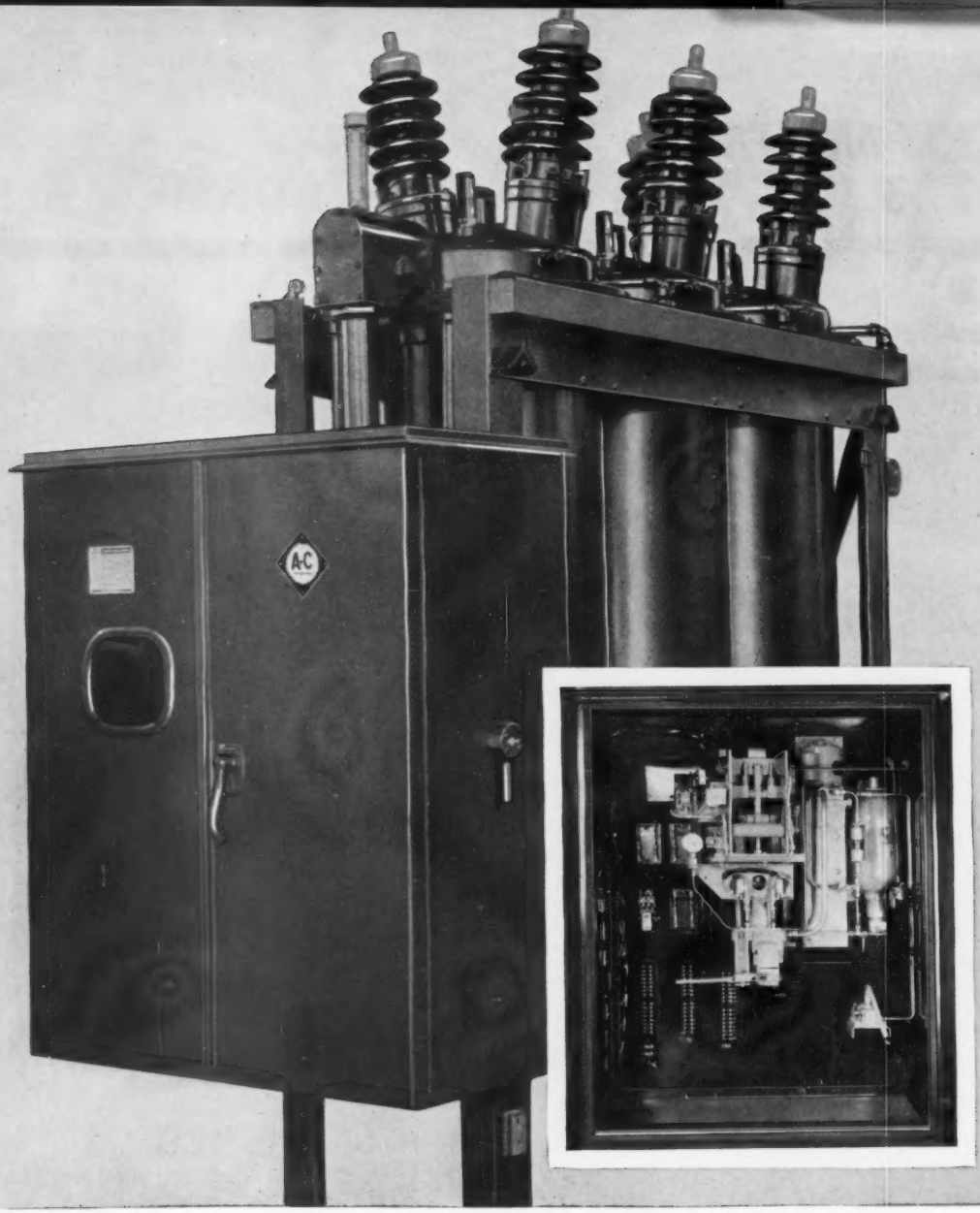
"Difficulties of interconnecting power systems on such a huge scale are enormous, but advantages far outweigh them. In the Northwest Power Pool we figure link-ups among state and interstate systems save us building power plants totaling a million kilowatts in generating capacity. That's equivalent to two Bonneville Dams.

"Growing population and booming Western industry are increasing power demands to the point where even large individual suppliers of electricity, private and public, soon will be swamped if they try to go it alone."

Lee said the electric generating ability of the bureau's various hydroelectric plants is reaching capacity performance while the demand keeps growing. Help is needed to carry the load, he said.

In the three-state power pool, which was previously linked, the bureau supplied 315,000 kw, Public Service Co. of Colorado 580,000 kw and others associated with the system bring the total nearly to 1,000,000 kw.

Pacific Power & Light is completing a line from Billings to Yellowtail Dam. Another Pacific line will be completed this year between Yellowtail and Casper.



Now Pneu-Draulic Operators

At the request of numerous utilities, Allis-Chalmers design engineers have now made available to you *Pneu-Draulic* operators on smaller breakers.

Enjoy the simplicity and reliability of the *Pneu-Draulic* operator on your next breaker.

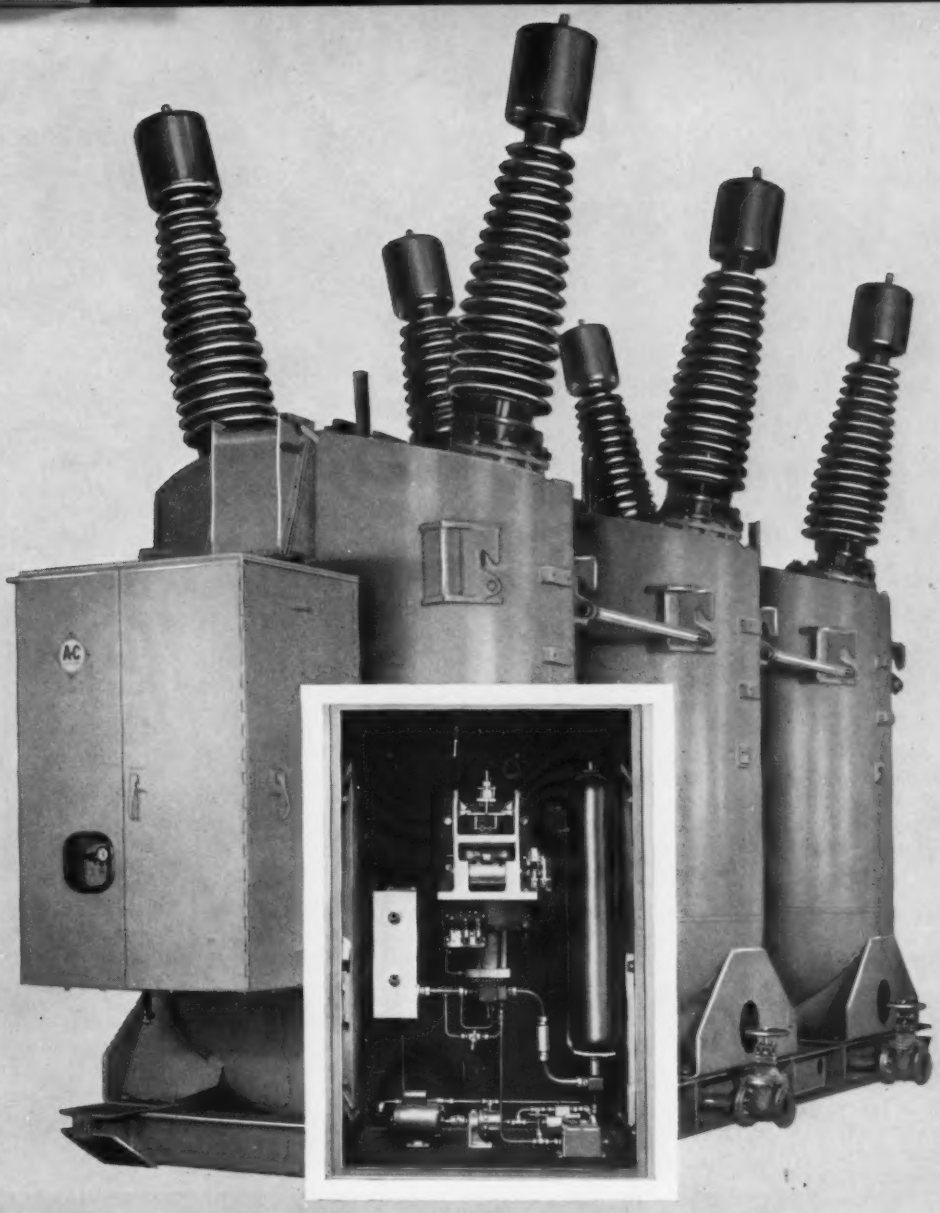
Acceptance of the *Pneu-Draulic* operator is based on the fact that it's as simple as it looks. It eliminates the mechanical problems inherent in previous mechanisms.

For complete information call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pneu-Draulic is an Allis-Chalmers trademark.

LIVE BETTER ELECTRICALLY

ALLIS-



for Breakers 500 Mva and Larger

Features of *Pneu-Draulic* Operator

- Simple — Has fewer parts than other types of operating mechanisms.
- Eliminates moisture, corrosion, dust problems — entire system filled with oil containing inhibitor. Filtering eliminates dirt problem.
- Provides emergency closing — can be closed safely onto energized line when no control power is available.
- Mechanically trip-free.

CHALMERS

A-C ALLIS-CHALMERS

A-5131

Pictured is the scene upstream from a 510-ft dam that will be a part of the Lewis River development that is going to be undertaken by Pacific Power & Light Co. and Cowlitz County PUD. The view is from the approximate location of the axis of the dam. Arrow points to the spot where the upstream portal of the diversion tunnel will begin taking Lewis River water around the construction zone. The two utilities filed jointly for permits

Arizona Company Plans Big Generating Station

Firm orders for equipment to go into Arizona Public Service Co.'s Ocotillo steam-electric generating station have been placed. The plant will have two 110,000-kw units.

President Walter Lucking said, "We plan to have Ocotillo plant on the line in the spring of 1960 . . ." He said that if continued growth of the area indicates an earlier need for the capacity, construction can be rescheduled so the plant will be ready in 1959.

The plant is to be located on 160 acres of land northeast of Tempe.

Diesel-Gas Engines To Power B.C. Plant

One of the largest piston engine electrical power plants in Canada is going to be constructed by the British Columbia Power Commission at Prince George.

The plant will contain 20 big 4,210-hp engine-generator sets, all operated by one man from a remote control room.

First stage of construction will be to build a two-story control section and part of one of the extensions that will house the generators. Four generators have been ordered.

Engines will be supplied by Cooper-Bessemer Co., and will weigh about 100 tons each. They will be capable of developing full power at only 327 rpm on either diesel oil or natural gas. The first unit will run on diesel fuel until natural gas is available at Prince George. In case the target date for construction is not met, the commission will move portable units in to supplement the city's plant. The site for the plant has not yet been chosen.

Application Planned For Boundary Project

The city of Seattle plans application for a Federal Power Commission construction license for its proposed Boundry hydroelectric project. It is to be on the Pend Oreille River in northeastern Washington.

Councilman Bob Jones, chairman of the utilities committee of the Seattle City Council, has revealed he plans to ask the council for permission to file the application.

City Light obtained a preliminary permit for the 600,000-kw project in August 1954. Surveys and explorations have established feasibility of the project, Jones said.

B.C. Electric Opens New 132-kva Substation

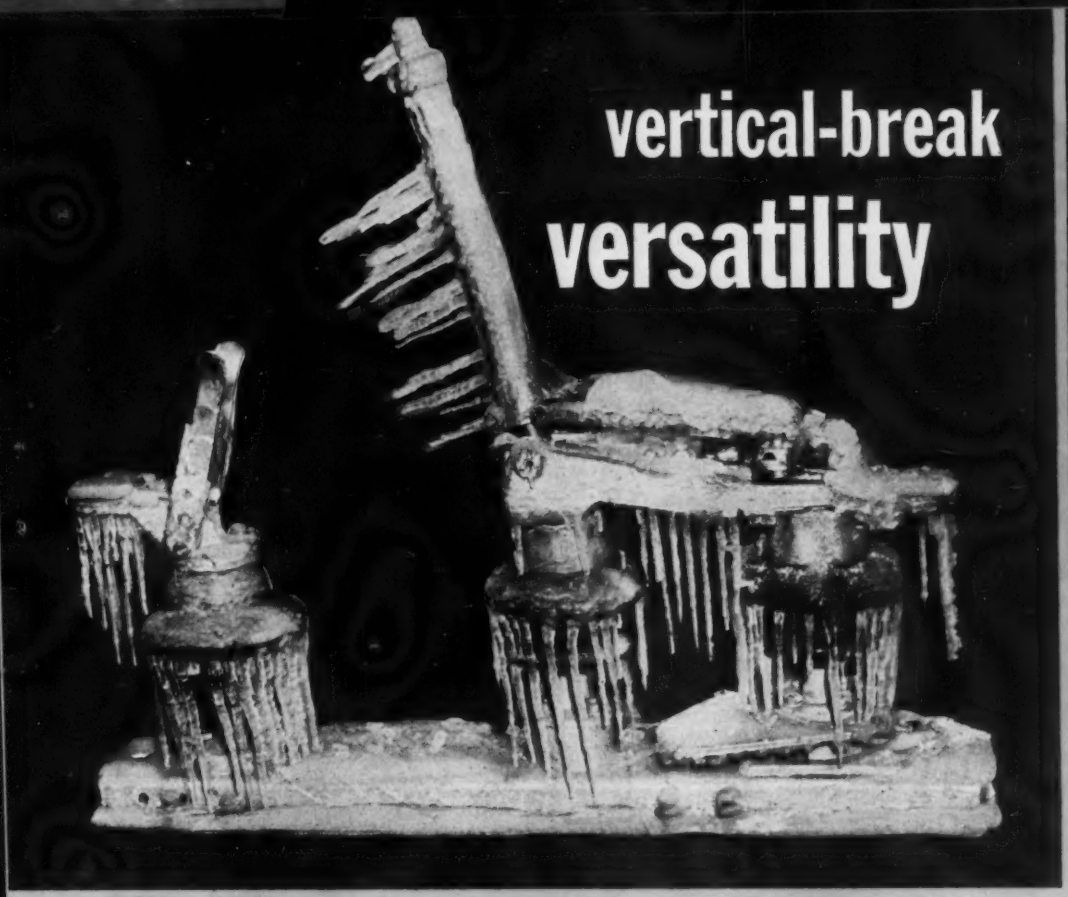
Howard Walters substation was recently opened at North Vancouver, British Columbia. The $1,900,000 unit steps down the 230 kv of the Bridge River substation to 60 kv.

Initial capacity of the new facility is 132,000 kva, which is almost double the present power needs of the North Shore.

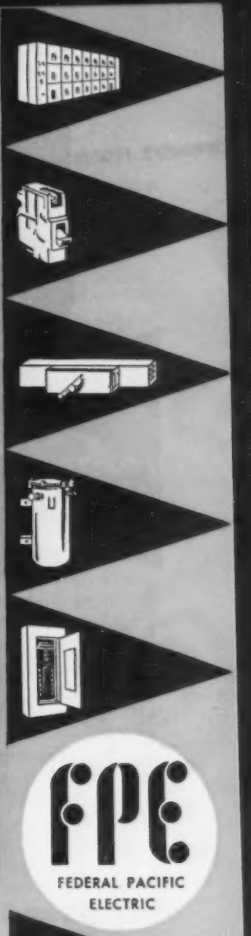
The station is named after Howard Walters, who recently retired as sales manager of British Columbia Electric Co.

• **Southern Nevada Power Co.** has filed an application with the Federal Power Commission for authority to issue $4,000,000 principal amount of its first mortgage bonds, due 1986. Money is for improvement of facilities.

Arrow points to location of a new power house for Pacific Power & Light's Merwin hydroelectric project, also on the Lewis River (see photo above). The power house will have a 45,000-kw unit to go on the line in 1958, boosting capacity of Merwin to 150,000 kw



vertical-break versatility



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announcing the new

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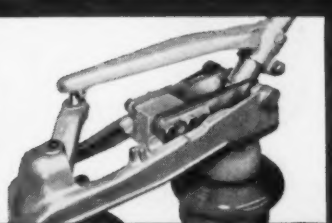
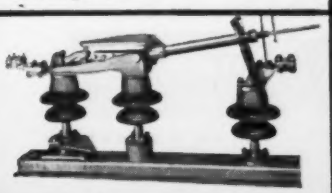
TG-O AIR SWITCH



Single-Link Simplicity—Only one moving link connects the arm at the top of the rotating insulator with the blade assembly—the simplest and most efficient enter-turn type mechanism.

Single-Pole Switch Unit—In the closed position.



The new TG-O Vertical-Break Air Switch is designed so that it may be stocked by utilities for immediate field installation over a wide range of conditions.

The new TG-O has proven to be outstandingly efficient under the most severe icing conditions. The large force leverage near the end positions and the shape of the parts at the hinge and clip ends assures progressive shattering of ice without cantilever stress on the insulators.

The versatile TG-O is available in sizes 7.2, 14.4 and 23-kv; 400, 600 and 1200 amp continuous; 20,000, 40,000 and 61,000 amp momentary ratings; A.S.A. and N.E.M.A. standards. Write for Catalog No. 4-126 for full details from the Pacific Electric Switchgear Division, 5815 Third Street, San Francisco 24, Calif.

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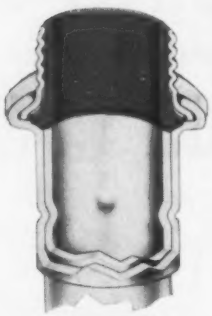
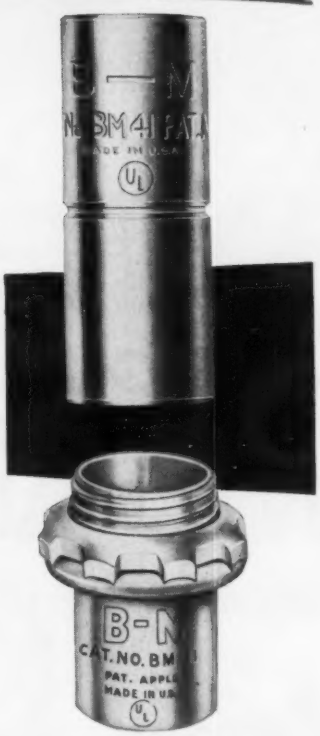
Red Throat
Insulated
Connector



Red Throat
Cross section



Briegel, the Original Indenter Fittings are neater in appearance, easier and faster to use. Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job.

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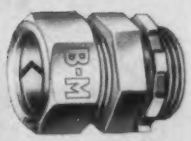
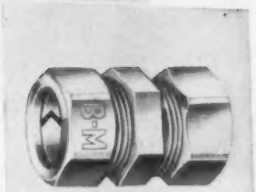


SIZES FROM ½" to 2"



SIZES FROM ½" to 2"

SIZES ½" ¾" 1"

SIZES ½" ¾" 1" 1¼"

SIZE ½"

BRIEGEL METHOD TOOL CO.
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PP&L and Cowlitz PUD Apply Jointly on Swift

Pacific Power & Light Co., Portland, Ore., and Cowlitz County, Wash., PUD No. 1 have filed applications jointly with the FPC for licenses for the proposed Swift hydroelectric development on the Lewis River in southwest Washington where PP&L has two existing projects.

It was an amendment of an earlier PP&L bid (December) for the license on the entire $56,000,000 proposal.

PP&L asks license for Swift No. 1 site, which will have three generators of 63,000-kw rating and cost $44,000,000 while the Cowlitz PUD asks for license on Swift No. 2, which would have two generators of 33,750-kw rating and cost about $12,000,000.

PP&L notified FPC it intended to purchase the energy generated by the PUD's power house until the district required the capacity.

The Swift No. 1 project involves a 410-ft-high dam forming a reservoir extending about 12 miles upstream. A 1,580-ft power tunnel would branch into three penstock tunnels reaching to the power house. Turbine ratings would be 87,000 hp each.

Swift No. 2 calls for a power canal and forebay extending 3½ miles from No. 1 project. This would feed a power house to be located at the head of a reservoir formed by PP&L's Yale dam. The two turbines would be 46,000 hp.

McNary Using Reservoir As Columbia Flow Drops

In early September, the entire flow of the Columbia River at McNary Dam was being diverted through power house turbines, and was sufficient only to turn them at minimum generator load. Flow was approximately 123,000 cfs.

During week days, river flow was supplemented by drawing down the reservoir, and on week ends the reservoir level was restored.

Copco Seeks License For Rinchel Project

California Oregon Power Co., of Yreka, Calif., has filed an application with the Federal Power Commission seeking a license for the proposed Rinchel development on the McCloud River in Shasta and Siskiyou Counties, Calif.

The proposed project would consist of a rock-fill dam; a reservoir about four miles long with a usable storage capacity of 16,000 acre-ft; a tunnel intake; a 15-ft diameter tunnel about 1¼ miles long; a surge tank; a power house containing two outdoor-type generating units, each comprised of a 44,000-hp turbine connected to a 32,500-kw generator; a substation; and appurtenant facilities.

The proposed Rinchel development is one of six units contemplated for the development of the McCloud River basin. The estimated cost for the proposed Rinchel development is $17,933,000.

Candidates Will Debate On Power Development

Power became an issue in the race for the U. S. Senate seat from Washington State, as it already is in nearby Oregon, when Sen. Warren B. Magnuson, Democrat, accepted the challenge of Gov. Arthur B. Langlie, Republican, to a debate on "power and how it should be developed to the best interests of the people."

Nomination of Magnuson and Langlie by the respective parties is conceded.

Langlie extended the invitation in a TV-radio appearance, in which he again expressed his opposition to a high, federally sponsored dam in the Hells Canyon stretch of the Snake River. Magnuson immediately accepted the offer, expressing the hope the debate "can be arranged later in the campaign when the issues crystallize."

Langlie, in the address he prepared for TV-radio delivery, declared the issue at Hells Canyon "is not one of 'public' vs. 'private' power" but "a matter of a wasteful, gigantic political monument vs. sound economic common sense." Privately financed low dams would provide lower-cost power than a high dam, he said.

Rate Relief Sought By Southern Edison

Application for a general rate increase has been filed with the California Public Utilities Commission by Southern California Edison Co.

This is the second time since 1921 that the company has sought rate relief.

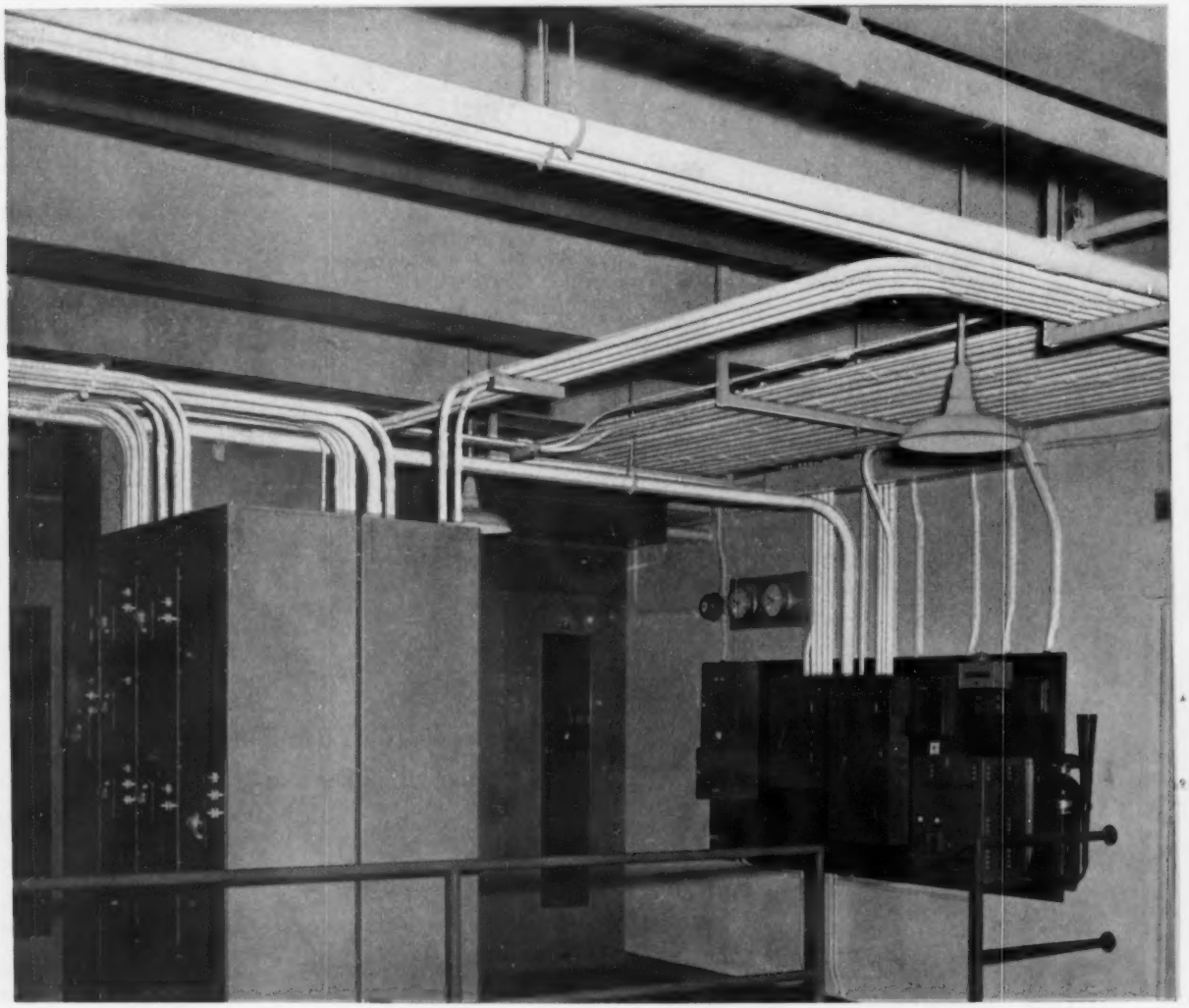
Although the new rates are not expected to be in effect for the full year 1957, Edison's proposed adjustment, if authorized, would increase annual revenues about $13,500,000.

Edison President Harold Quinton termed filing for a rate increase at this time as being "imperative" in the light of continuously rising costs in all phases of the electric utility business.

Mercy is the mission of the new Grossmont Hospital in San Diego's La Mesa area. Rome • RIGID provides lasting and safe protection for wiring throughout the entire building.

Merchandising is the mission of the Marston Company's new wing in San Diego. Capitol Electric Company specified Rome • RIGID for this important installation.

Two more for Capitol



A section of the Marston Company installation. You can get Rome • RIGID heavy-wall conduit in sizes from ½" to 6", with immediate shipment from Torrance California.

The Story of Rome • RIGID, 8 pages of profitable reading for everyone in the electrical construction industry. Write today for your *free* copy.

important installations

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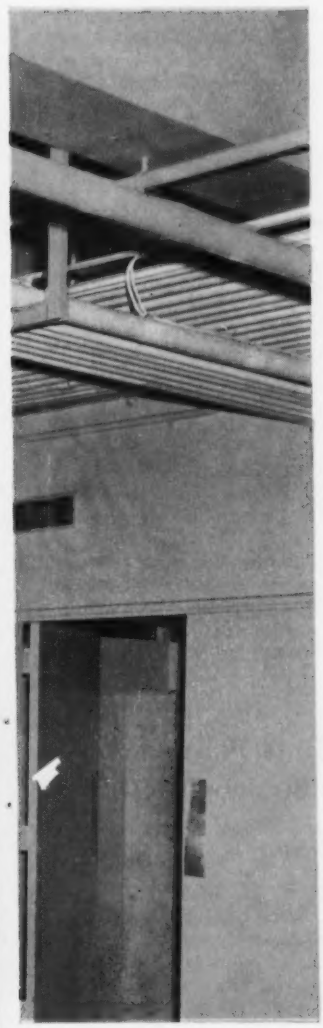

Just as Capitol Electric Company does, you can build business by selling quality installations with Rome·RIGID steel conduit.

Case histories in point are the new wing of the Marston Company store and the new Grossmont Hospital, both San Diego, and both with Rome·RIGID conduit.

When you base your bid on Rome·RIGID you can figure on lower installation costs and a minimum of trouble. We assure you of this in the way we make Rome·RIGID.

Like no other

No other conduit can compare with Rome·RIGID because there's no other made *quite* like it.

We make it from hot-rolled sheet steel, shot-blasted on both sides to remove all oxides, dirt, rust and roughness. Then it's cold formed, thus retaining its strength and wall uniformity.

As the pipe is formed we make an electrical resistance weld which provides a superior joint, uniform pipe diameter, and surface quality. Of course, we painstakingly scarf away inside and outside weld flash.

Hot-dip galvanized

Then, to give you conduit with a bright, tightly bonded, ductile zinc-coated surface, we employ the Sendzimir hot-dip galvanizing process.

The result of this automatically controlled process is a conduit with high uniformity of handling characteristics and quality on the job.

And it goes almost without saying that Rome·RIGID is smooth and easy to fish. You practically whisk cable through its low-friction, smooth interior—another saving of time and labor.

See your electrical distributor today. On your next conduit job, specify Rome·RIGID.

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SIL-THIN-GLAS AND SIL-THIN-BESTOS—Extra-thin high temperature insulation for wrapping armatures, fields, stators, relays, transformers and coils.

STICK-GLASS*: Wrapping for small coils where space is limited and holding down of wrapping is difficult. Ideal for toroidal coils. Thicknesses .005″-0.15″. Dielectric strength of "A" glass (1300 vpm).

SUN-PLI—Asbestos paper combinations. Improved mechanical and electrical strength plus high moisture resistance.

SIL-GLAS—Uses: coil wrap or tape—slot cell insul.-layer insulation. Flexible 200°C heat resistance, good abrasive resistance, 2.5 Dielectric constant at 25°C. ¼″ diel. breakdown 5000 V @ .003″ to 10,000 V @ .010″. 1% power factor. Thicknesses .003″-.010″.

ELASTOMERIC FIBERGLAS—Highly water repellent. Impregnated and coated with silicone rubber. Cured or uncured. Baking uncured to 360°F provides after-cure for tough, abrasive-resistant finish. Cured E-F has dielectric strength of 800 VPM @ 25°C for .007″, and power factor of 0.7%.

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Grant PUD Hits Snag In Turbine Changes

The right of Grant County PUD to change the brand of turbines and governors to go into Priest Rapids power house, at additional expense, is being challenged by a taxpayer's suit filed by E. C. Olander of Moses Lake, Wash.

Merritt-Chapman & Scott's low bid on the project was based on supplying English Electric Co. turbines, but the PUD entered into a supplemental contract of option with the contractor to supply Allis-Chalmers turbines for an additional $500,000.

Olander's suit, filed in Grant County Superior Court, charges that it is illegal under state law and international treaty for the PUD to pay extra for American equipment after acceptance of a low bid.

Edison Gets Exemption On Proposed Stock Sale

Southern California Edison Co. has been granted exemption from competitive bidding by the California Public Utilities Commission on a proposed issue of 500,000 shares of common stock.

A registration statement covering these shares was also filed with the Securities and Exchange Commission in Washington, D. C. Proceeds from the issue will be used by the company to finance its continuing construction program.

Harold Quinton, Edison president, said negotiations are under way with the First Boston Corp. and Dean Witter & Co. to form and manage a nationwide underwriting group to offer the stock.

WWP Gets Permission To Buy Bunker Hill

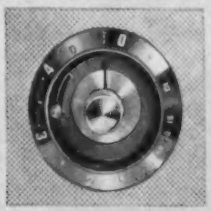
Washington Water Power Co. of Spokane, Wash., has been authorized by the Federal Power Commission to purchase those electrical operating facilities of the Light House System of Bunker Hill Co. of San Francisco, Calif., which are subject to FPC jurisdiction.

Excluded from the acquisition by Washington are certain electric facilities used by Bunker to distribute electric energy for use in its mining and smelting operations.

The Light House system distributes electrical energy in the towns of Kellogg, Wardner and Smelterville, and nearby rural territory, all in Shoshone County, Idaho.

Super-Matic

AUTOMATIC SURFACE UNIT . . . fry, boil, saute, pan broil and grill with thermostatically controlled, balanced heat at all times.



AUTOMATIC MEALTIMER . . . Select desired Super-Matic heat and set MEALTIMER for time food should cook—on surface or in deep well. Food cooks at the proper heat for the proper time, then it shuts itself off . . . automatically!

AUTOMATIC FRENCH FRYER, DEEP-WELL COOKER . . . makes soups, stews, economy meals—even bakes under controlled heat.

AUTOMATIC CUSTOM COOKER-SERVER . . . it's a frying pan, a grill, a waterless cooker, even a Dutch Oven. Precision timed and heat controlled by the Super-Matic Calrod® Unit and Mealtimer.

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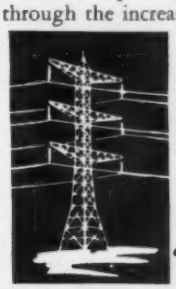
SUPER-MATIC COOKS ALL WAYS... AUTOMATICALLY!

Hotpoint Electric Ranges cook everything in the book—*automatically!* With a range line already loaded with super-cooking features, now they can fry . . . bake . . . broil . . . simmer . . . stew . . . deep-fry . . . grill . . . *all automatically* with Hotpoint's new SUPER-MATIC!

Hotpoint's Super-Matic offers the homemaker undreamed of convenience . . . unmatched freedom from time-consuming cooking chores . . . *plus* faster, more precise cooking.

And Hotpoint's Super-Matic offers utilities expanded revenue through the increased demand Super-Matic is building for automatic electric ranges.



Have your Hotpoint Distributor Show You The Complete NEW Hotpoint Range Line for '56 . . . Six New 39" Models . . . Two New 30" Models . . . And Five Beautiful Hotpoint Colortones, As Well As Classic White.

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HOTPOINT Co. (A Division of General Electric Company) **5600 West Taylor Street, Chicago 44, Illinois**

New space-miser network transformer now 12″ shorter, 20% lighter, occupies 15% less space

Slashing maintenance a dozen ways is the story of the new Westinghouse 500-kva subway transformer. Easier servicing and even better electrical performance place this product in a class by itself.

1. Protection against partial vault flooding—with a 12″ reduction in height, transformers can now be off the floor, set on I beams.

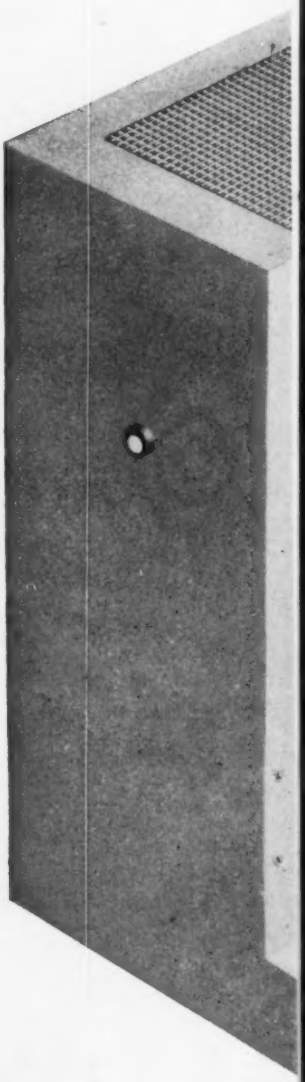
2. Installation easier, handling safer—new transformer is 20% lighter.

3. Contoured . . . round corners replace sharp edges on new diving bell tank.

4. Easier to wash down and paint, virtually self-cleaning—new contour design of Yukon Coolers eliminates 68 former sources of corrosion.

5. More accessible high-voltage terminal chamber—exclusive integral tank design lowers switch compartment; switch and core-coil assembly now housed in one smooth, unwelded exterior on a common base plate.

For network transformers that set the standard, talk to your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70781



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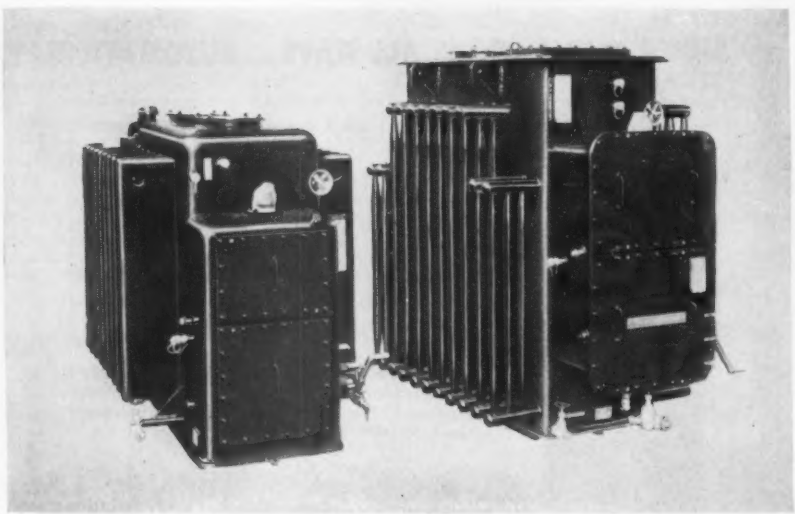
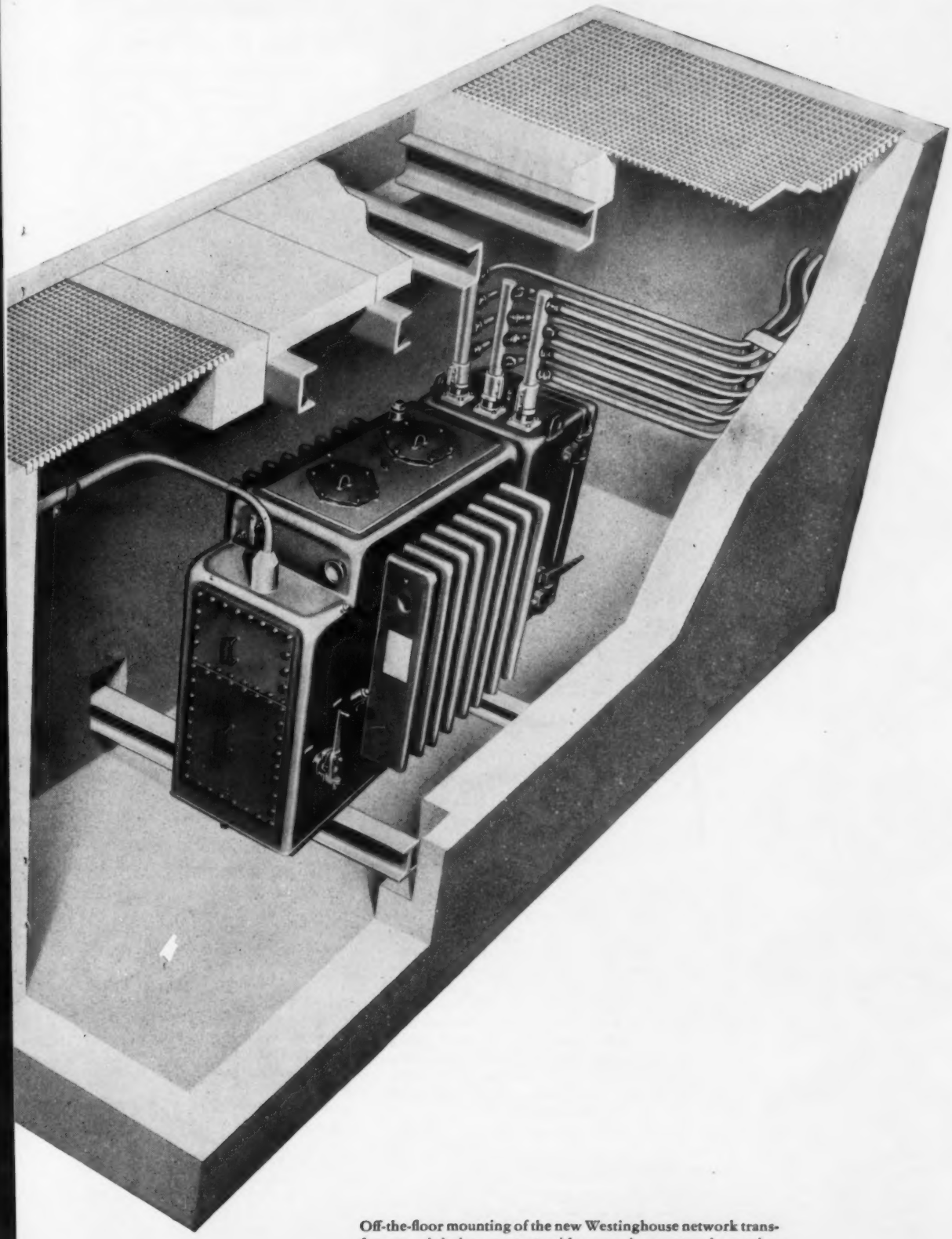


(*Right*) Previous 500-kva network subway transformer. (*Left*) New Westinghouse design features exclusive Yukon Coolers, greater spacing, more clearance to floor—refinishing is no problem.



Off-the-floor mounting of the new Westinghouse network transformer minimizes contact with corrosive matter; inspection and maintainance are quicker, easier.

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the FANNER MANUFACTURING COMPANY
This new FANNER Catalog illustrates and describes the wide range of Superformed Line Conductor Accessories . . . gives selection tables, application data and suggested installation methods. Get acquainted with this catalog now so that when you need accessory items for overhead distribution and transmission lines, you can take advantage of the many extra features of Fine FANNER Superformed products. Each product in the FANNER Superformed line is precision manufactured to install easier and perform better on the job. Careful packing insures safe delivery and simplified storage. Highest quality materials provide long life regardless of the type of installation. With all their extra features, FANNER Superformed products cost no more than ordinary products.
For the latest data on line conductor accessories — information that will be of exceptional value to you, write for the new FANNER Catalog EP6 today!
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THE FANNER MANUFACTURING CO.
Electrical Products Division
Brookside Park • Established 1894 • Cleveland 9, Ohio
AGENTS AND DISTRIBUTORS IN PRINCIPAL CITIES

New Rates In Effect For San Diego Area

San Diego Gas & Electric put a new electric rate schedule into effect Sept. 1. Only change for residential users is that customers who are not on line extension contracts will not have a minimum charge applied for large heating or power loads.

For general service—businesses and small industries—customers with three-phase or combination single- and three-phase service will come under the schedule previously applied only to single-phase service. A surcharge will be added, however—40c per month per hp of connected polyphase load. Single-phase rates will remain the same.

Military and large industrial customers get a new rate schedule that sets $150 as monthly minimum charge.

Oregon PUC to Rule On Demand Charges

Pacific Power & Light Co. has asked Oregon Public Utilities Commission for approval of an elimination of demand charges from single-phase residential service in areas of the state where such charges are now imposed.

PP&L estimates the saving will be $37,000 annually to the customers presently required to meet the demand feature for space heating service.

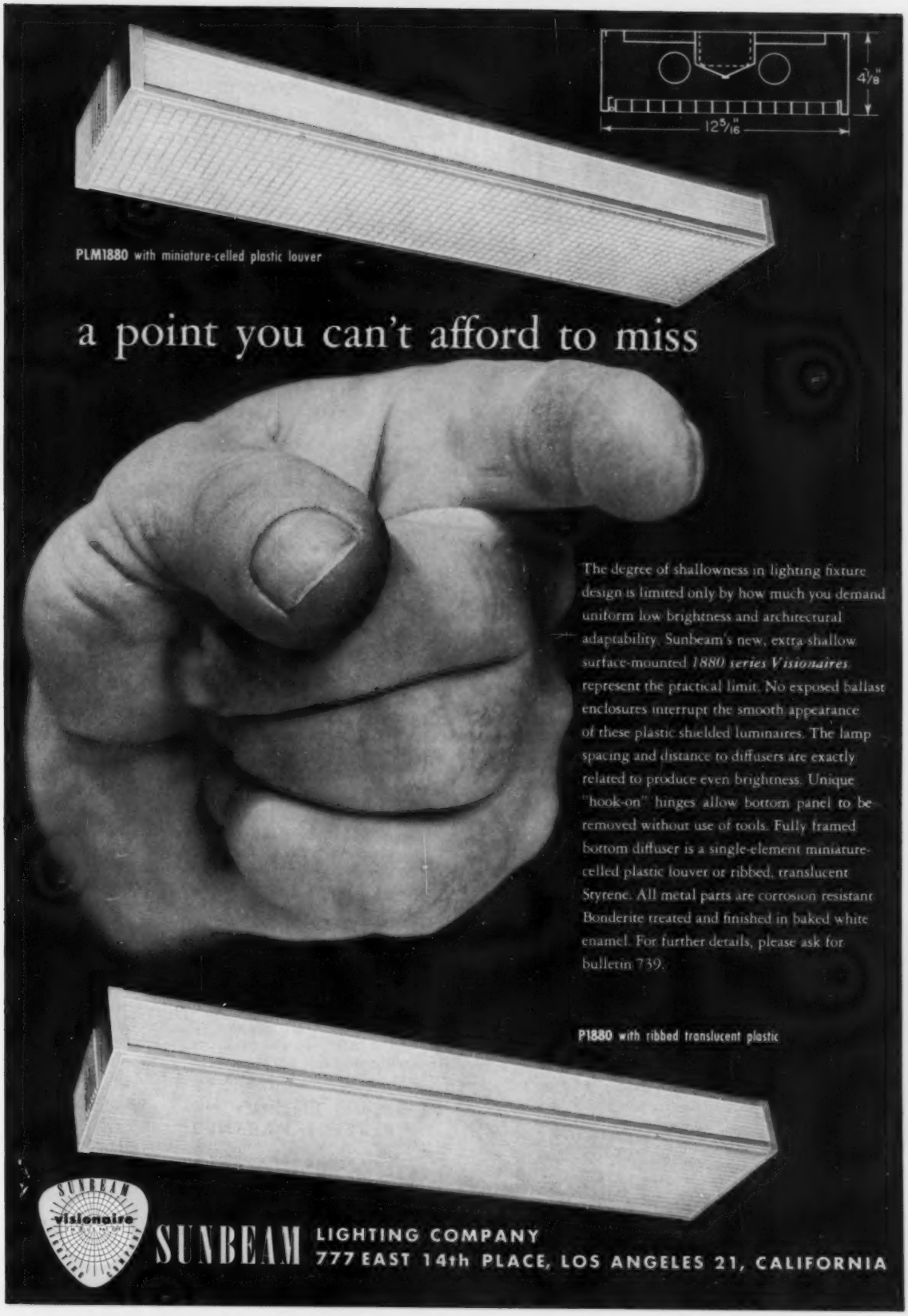
The schedule would make PP&L's present Portland area program for such service uniform throughout the state in areas served by the utility.

Anchorage May Sell To Chugach Electric

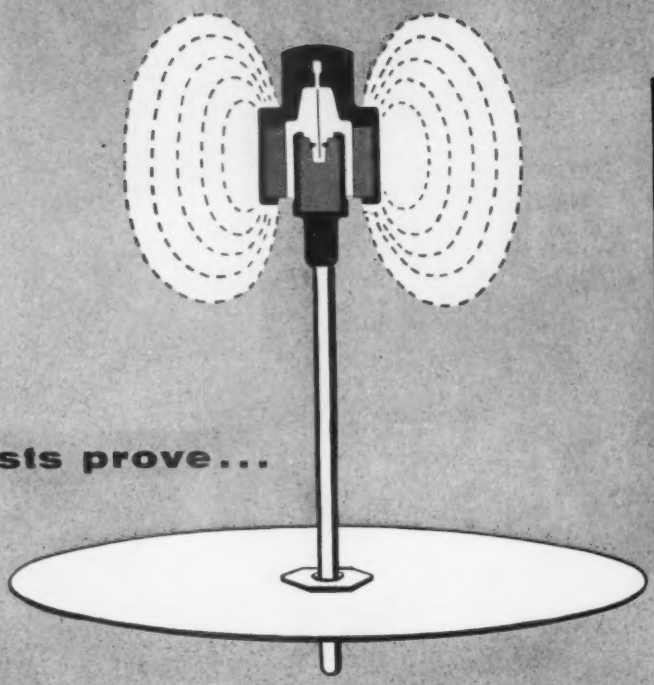
The city of Anchorage, Alaska, is considering sale of its power system, valued at $1,500,000, to the Chugach Electric Assn., which supplies power to areas outside the city.

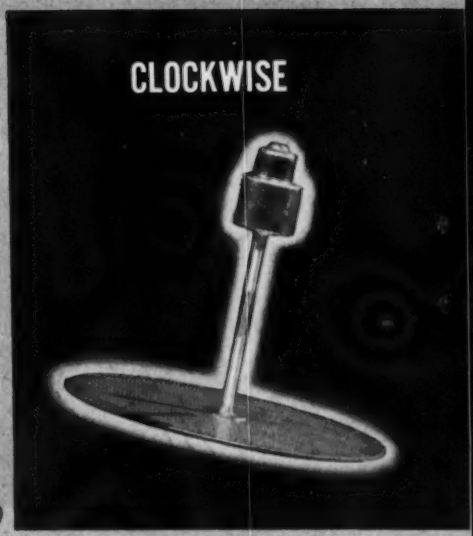
Under a proposal made by Marlin S. Stewart, Chugach manager, a municipal power commission appointed by the city council would have the power to regulate rates and service for city consumers. Both the city and the association buy power from the Bureau of Reclamation's Eklutna hydro project and the association also operates a steam plant.

• **Cowlitz County PUD** is planning construction of a $300,000 office building in Longview, Wash. The building will cover an area of 15,000 to 20,000 sq ft, according to Manager Glenn Hittle.


4⅛"
12 5/16"
PLM1880 with miniature-celled plastic louver
a point you can't afford to miss
The degree of shallowness in lighting fixture design is limited only by how much you demand uniform low brightness and architectural adaptability. Sunbeam's new, extra-shallow surface-mounted 1880 series Visionaires represent the practical limit. No exposed ballast enclosures interrupt the smooth appearance of these plastic shielded luminaires. The lamp spacing and distance to diffusers are exactly related to produce even brightness. Unique "hook-on" hinges allow bottom panel to be removed without use of tools. Fully framed bottom diffuser is a single-element miniature-celled plastic louver or ribbed, translucent Styrene. All metal parts are corrosion resistant Bonderite treated and finished in baked white enamel. For further details, please ask for bulletin 739.
P1880 with ribbed translucent plastic
SUNBEAM visionaire
SUNBEAM LIGHTING COMPANY
777 EAST 14th PLACE, LOS ANGELES 21, CALIFORNIA

Lab tests prove...

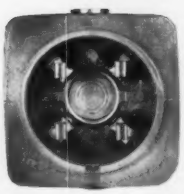


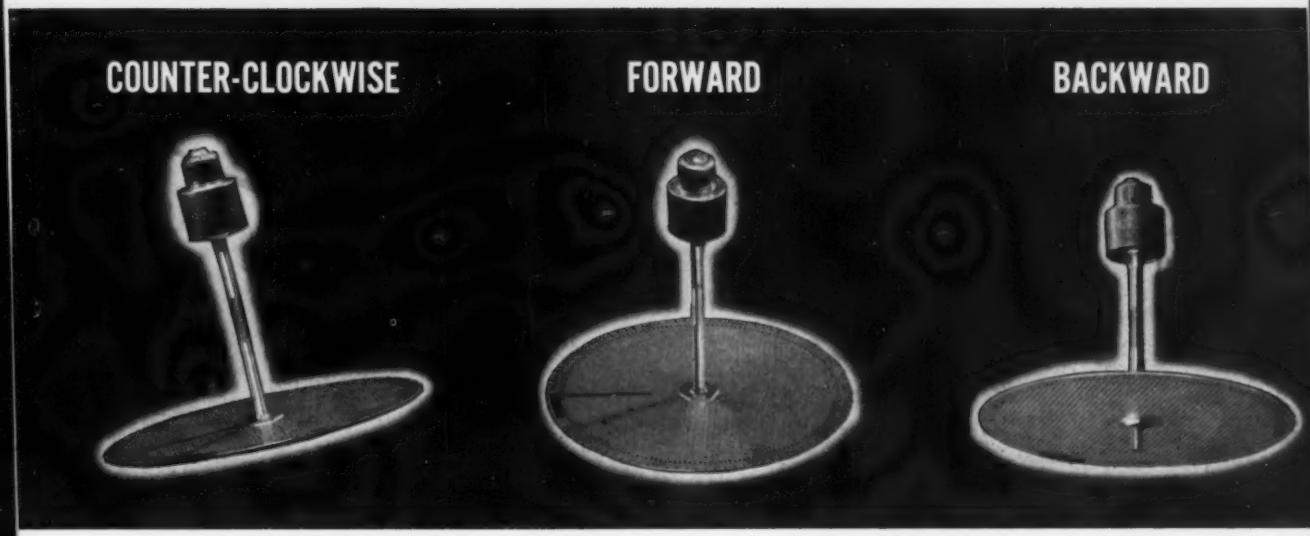


MAGNETIC SUSPENSION

General Electric's New "PERFECT PARTNER"

the S-1 square meter socket, designed for use with extended-range meters such as the G-E I-55 on installations up to 100 amps.





CUTS METER TILT LOSSES

"FLOATING DISC" OUTPERFORMS BALL BEARING SYSTEMS AT ANY TILT ANGLE

It's a basic fact that the more friction in the bearing system of a watthour meter, the less accuracy you'll obtain. One of the common causes of such friction is a slightly tilted meter. Ordinary watthour meters can and do develop increasingly more friction on the bearing system at any angle of tilt. General Electric I-55 meters with the revolutionary "floating disc," however, have virtually eliminated friction in the bearing system. This means that should a G-E meter be tilted, any loss in accuracy will be practically negligible.

A recent series of tests conducted at G-E laboratories analyzed meter performance at various degrees of tilt. They conclusively indicated that the I-55, due to the superior inherent characteristics of the magnetically suspended rotor, outperformed every other meter. Held under both full and light load conditions, the tests showed the I-55 least affected by tilt—at forward, backward, clockwise and counterclockwise positions. As the angle of tilt was increased on ordinary meters with ball bearings, additional friction resulted. G-E meters with magnetic suspension developed no measurable friction when operated out of plumb . . . even as the angle of tilt was increased. Life of the bearing system was not affected and errors in registration were negligible.

Protection against tilt errors, and other types of inaccuracies that cause serious loss of revenue, is only one of the many ways that G-E meters help pay for themselves and protect you with accurate measurement of all the energy you supply. For other important money saving benefits—greater sustained accuracy, longer meter life with less maintenance and testing time, and elimination of bearing replacement—specify G-E meters of the I-50 family . . . the only meters with the "floating disc."

For more information, contact your nearby G-E Apparatus Sales Office, or write General Electric Company, Section 621-8, Schenectady 5, N. Y.

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With factories in Anaheim, Los Angeles, Oakland, Ontario, San Francisco, San Jose, Seattle, and Richland, and Sales Offices in twenty Western cities.

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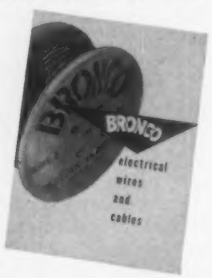
of wires and cables



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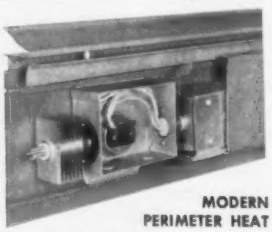
BRONCO 66 CERTIFIED
flexible
electrical
portable cords and big cables
with 67.32% Neoprene jackets.

Send for your FREE copy:
WESTERN INSULATED WIRE CO.
Los Angeles 58, California

HEATSUM ELECTRIC BASEBOARD
(Illustration of cut-a-way section)



MODERN PERIMETER HEAT

SAFE—Low surface temperatures and safety cutout protects furniture.
2-HEAT, AUTOMATIC CONTROL — thermostat switches from high to ½ heat automatically. (Normally operates on ½ heat.)
HIGH CAPACITY—3000 watts in 8-foot unit on high heat. Less WALL SPACE required.
BASEBOARD UNITS—available in many lengths and wattages. They are designed for a completely harmonized installation in any room. Units may be joined; blank sections available for extensions.
EASY TO INSTALL—Units attach to wall surface in new or existing buildings.
All Baseboard units have two elements and can be used with our No. 332 Thermostat for 2-heat control.

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ROBERSON Inc.
1539 East 103rd St., Seattle 55, Wash.

Bids and Contracts

• Contracts for constructing a 161-kv transmission line from Casper and Glen Rock, Wyo., to the Yellowtail Dam site in Montana have been awarded by Pacific Power & Light Co. **Pole Line Construction** Co., Billings, will build 70 miles of line; **Detweilers** Inc., Twin Falls, 37 miles; and **Detweilers & Detweilers**, Twin Falls, the remainder of the 203-mile line. Total cost is to be $4,500,000.

• **Allis-Chalmers** Mfg. Co. has received a contract to supply two hydraulic turbines to be added to Fort Peck Dam.

• Award of a $1,384.736 contract to the **Bethlehem Pacific Coast Steel** Corp. for the structural steel portion of the main building of Scattergood steam plant, near Hyperion, was announced by Los Angeles Board of Water Power commissioners.

Bonneville Awards

The following contract awards have been announced by Bonneville Power administration:

J. M. Montgomery Co., Los Angeles, construction of a second transformer bank at Columbia substation, $68,998;

Casey Electric Inc., Seattle, construction of 115-kv transmission line No. 1, The Dalles to Big Eddy, $27,082;

Electric Transmission Equipment Co., Portland, supply bus and switch insulators, $103,400;

J. H. Baxter & Co., Portland, $98,375, **McCormick & Baxter** Creosoting Co., Portland, $24,222, for poles on bid invitation 8120;

Pettijohn Engineering Co., Portland, clearing danger trees on Lee's Camp-Wilson's Camp section of Forest Grove-Tillamook line, $1,025;

K. F. Jacobsen Co., Portland, construction of paving extensions at J. D. Ross substation, $8,983;

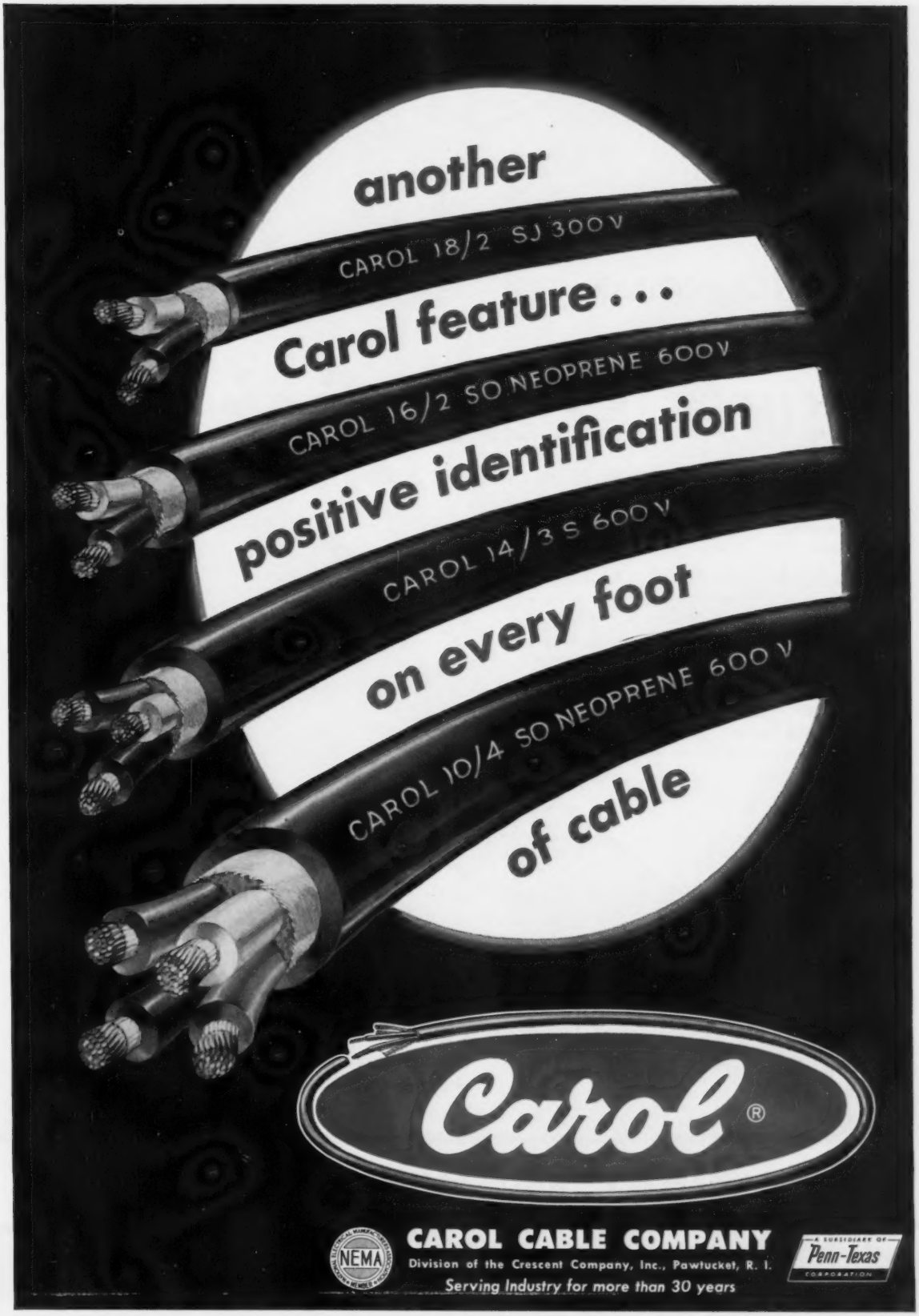
Legnano Electric Corp., New York, supply instrument transformers, $74,089;

R&IE Equipment Division, I-T-E Circuit Breaker Co., Greensburg, Pa., for disconnecting switches, $79,490;

Screw Machine Products, Portland, $5,255, and **Bethlehem Pacific Coast Steel** Corp., San Francisco, $111,680, invitation 8104 to supply substation steel;

Moloney Electric Co., St. Louis, for three-phase power transformers, $219,552;

W. L. Ridge Construction Co., Spokane, to construct section of the Chief Joseph-Covington line No. 1, $311,054.


another
CAROL 18/2 SJ 300V
Carol feature . . .
CAROL 16/2 SO NEOPRENE 600V
positive identification
CAROL 14/3 S 600V
on every foot
CAROL 10/4 SO NEOPRENE 600V
of cable
Carol®
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CAROL CABLE COMPANY
Division of the Crescent Company, Inc., Pawtucket, R. I.
Serving Industry for more than 30 years
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CORPORATION

IT PAYS TO HAVE HUBBELL GOOD CONNECTIONS
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SUPER *Twist-Lock*®

SERIES 3000

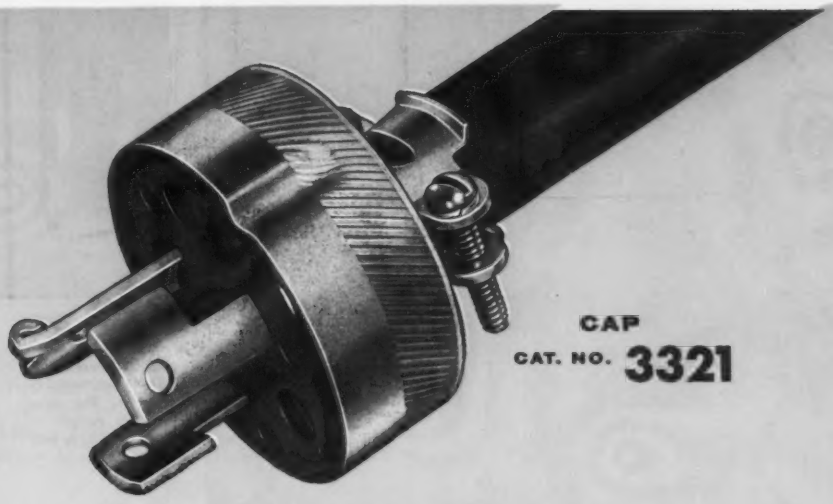
- ***Screwless*** **PRESSURE-GRIP** ***Terminals*** *simplify and speed wiring—provide a safer, more uniform contact*
- **Dead Front** *prevents entrance of dust, dirt, metal chips, etc. and assures utmost wiring security—no exposed wires—no fibre disc required.*
- **More Rugged** *— smaller size—lighter weight—more compact. Withstands roughest usage.*
- **Interchangeable** *with regular Twist-Lock units of equal size and rating*
- **Improved Cord Grips** *provide a tighter and stronger grip on the cable*
- **UL Approved** *—meets and exceeds rigid operation and performance tests*

CONNECTOR BODY
CAT. NO. **3323**

CUTS WIRING TIME 1/3

Screwless **PRESSURE-GRIP** terminal design saves valuable wiring time by eliminating troublesome wire bending and looping. Wiring can be completed in a few simple steps which , unlike the old "wrap around" binding post method, assure wiring uniformity with maximum terminal contact.

FIRST and still the **FINEST**...



CAP
CAT. NO. **3321**

. . . with Screwless PRESSURE GRIP Terminals and Dead Front

FOR FASTER, MORE SECURE WIRING

Here is the first major improvement in Twist-Lock design in many years . . . a new, tested and approved construction featuring screwless PRESSURE GRIP terminals to simplify and speed wiring, and a completely dead front construction to assure absolute safety and security. These features are incorporated in both the Super Twist-Lock cap and connector body. Units can be interchanged with regular Twist-Lock connectors of equal size and rating. Super Twist-Lock supplements the Twist-Lock line and does not obsolete existing devices.

NOW AVAILABLE . . .

2 Wire 20 Amperes 250 Volts

3 Wire 20 Amperes 250 Volts (AC or DC)
10 Amperes 600 Volts (AC only)

4 Wire 20 Amperes 250 Volts (AC or DC)
10 Amperes 600 Volts (AC only)

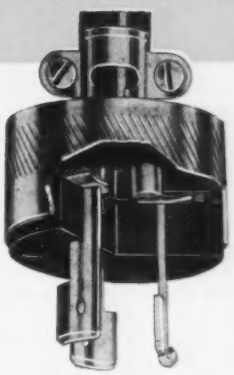
Sold Only Through Electrical Distributors

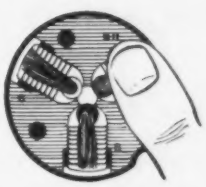
SCREWLESS
PRESSURE-GRIP
TERMINALS

Cut-away of assembled 2-piece cap showing powerful pressure grip action of contacts.

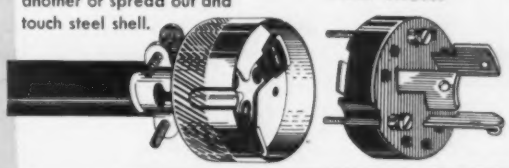
Cap is constructed in two independent sections with wires inserted and clamped between the two. The blade front is completely "dead" with no wires extending to the front. This eliminates need for fibre disc.

Wire ends simply press into their individual pockets and, with dead front in position, are securely locked in place. Wire strands can't contact one another or spread out and touch steel shell.

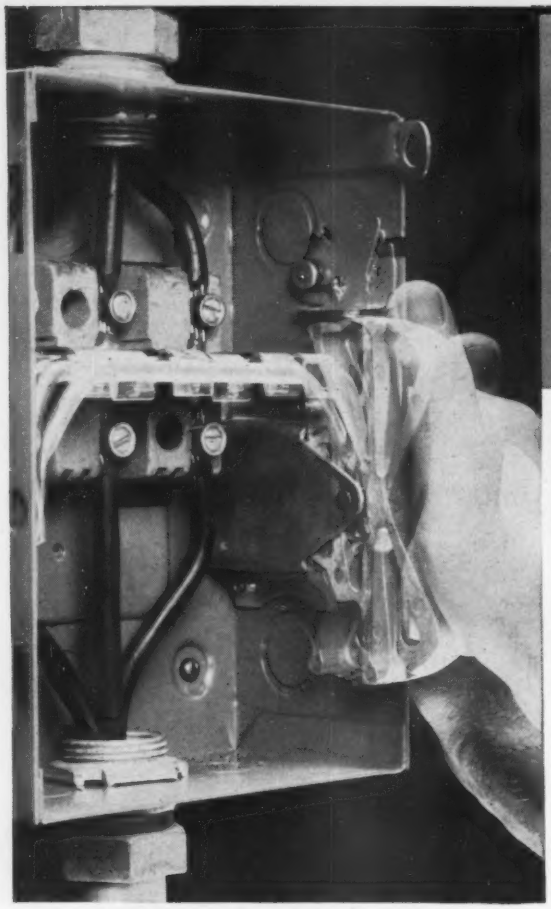




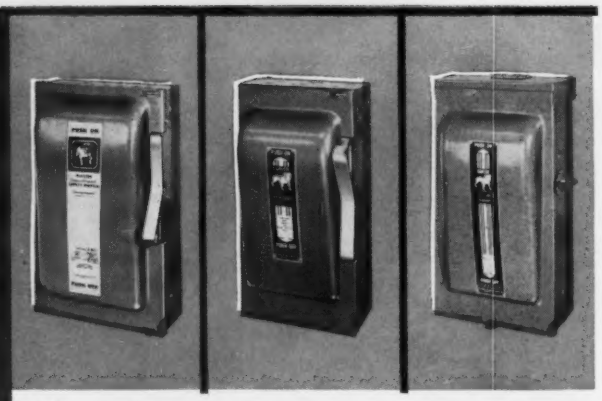
DEAD FRONT



HARVEY HUBBELL, INC.
BRIDGEPORT, CONNECTICUT



The positive arc-restricting switching action of BullDog's Clampmatic Vacu-Break Safety Switches is shown in the above demonstration photo of the switch interior. In all normal operation, the switch box door is closed.



MASTER CLAMPMATIC VACU-BREAK — Unequaled for quality and performance. Acts as disconnect or service entrance switch. Fills applications up to 1200 amps.

JUNIOR CLAMPMATIC VACU-BREAK—Deluxe general-purpose switch at an exceptionally low price. The complete line ranges in ratings from 30 to 600 amps.

RAINTIGHT CLAMPMATIC VACU-BREAK — Provides complete protection from rain, snow and sleet. Complete line ranges in ratings from 30 amp to 200 amp sizes.

Switch with Security!

GET BULLDOG CLAMPMATIC VACU-BREAK SAFETY SWITCHES

Greater safety . . . longer life . . . no costly maintenance!

BullDog Safety Switches bring you real extras — in safety, in performance, in longer life. The three types shown — Master, Junior and Raintight — cover a wide range of applications, meeting your needs with greater efficiency.

They feature these *Big 3* BullDog exclusives: (1) Vacu-Break® arc control, (2) Clampmatic® action, and (3) dependable switch mechanism.

The Vacu-Break control smothers arcs, minimizes pitting and burning. The Clampmatic action provides bolt-tight contact pressure. The BullDog switch mechanism *guarantees* positive switching security.

You'll find it's a switch to economy when you switch to BullDog Safety Switches. Consult your qualified electrical contractor or BullDog field engineer, or write BullDog Electric Products Co., Detroit 32, Mich.

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BULLDOG ELEC. PROD. CO. OF LOS ANGELES
2885 E. Washington Blvd.
Los Angeles 23, California

PNP Companies To Own Equities of 15% Each

Kinsey M. Robinson, president of Washington Water Power Co. and the Pacific Northwest Power Co., recently told the Federal Power Commission that PNP's $217,400,000 Mountain Sheep-Pleasant Valley projects would be financed through purchase of 15% equity securities by the four organizing utilities. The balance would be in bonds sold to institutional investors and the public.

Each of the four companies, WWP, Montana Power Co., Portland General Electric Co. and Pacific Power & Light Co., will take one quarter of the power produced, which is expected to cost about 2.42 mills per kwh.

Puget Power Dickers For Municipal System

Puget Sound Power & Light Co. may purchase a second municipal electric system if voters approve the transaction.

Members of the city council of Pacific have accepted Puget's offer of $110,756 for facilities, and voters will have an opportunity for approval in October.

First purchase proposal was $65,-452 for the electric system of South Cle Elum. It will up for vote in November.

Forest Products Use Big Amount of Power

Pacific Northwest forest products industries—lumber, plywood, pulp and paper mills—consumed more than 4,000,000,000 kwh of electricity in 1955 and will require 185% of this by 1980, according to Bonneville Power Administrator William A. Pearl.

Pearl told the Forest Industries Forum for Washington and Oregon the hydroelectric potential and the forestlands of the two states represent the region's most important "sustained yield natural resources" and he said cooperation between the federal government and public and private companies in both fields—power and forestry—were making possible the fuller utilization of the resources on which the states were so dependent. Pearl said the power load of the forest products mills was second only to the electroprocess industries, namely, aluminum and chemicals.

Detailing the power growth, Pearl said "Since May 1954, 10 of 30 new nonfederal power projects proposed by public and private groups have been licensed for construction by the Federal Power Commission and have a name-plate rating of more than 3,200,-000 kw. Six of the 10 projects with an installed capacity of 1,650,000 kw are already under construction."

He compared the dams under construction by nonfederal utilities as equal to more than six projects of capacity of Bonneville, the oldest federal hydroelectric dam on the Columbia River.

Water storage begins this month in the reservoir of the Bureau of Reclamation Palisades Project in southeastern Idaho on the south fork of the Snake River. The power house is to have four 28,500-kw generating units, with the first scheduled to go on the line early in 1957. Clean-up work will take another two years. Total project cost is $62,500,000

Colorado G&T Co-op Receives REA Loan

Final approval has been given by the Rural Electrification Administration on a $10,500,000 loan to the Colorado Ute Electric Assn. for construction of a steam-electric generating station and 168 miles of 115-kv transmission line.

Colorado Ute is an organization of four REA cooperatives in the southwestern section of the state. Under the plan, Western Colorado Power Co. would operate the plant for the co-ops.

The co-ops proved adequate coal supplies, water resources and location.

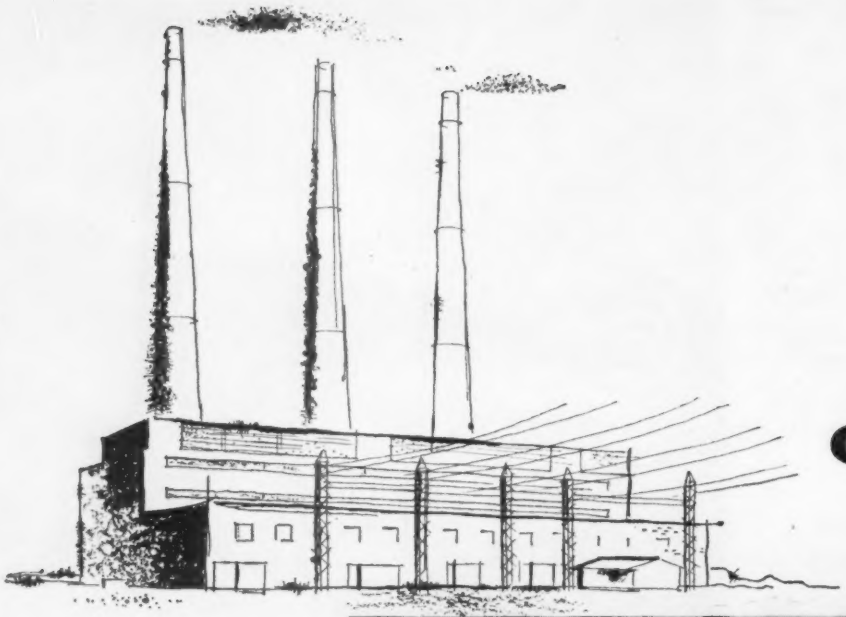
• **Tacoma,** Wash., City Light, on Sept. 1, increased its purchases from the Bonneville Power Administration to a rate of $2,712,000 a year, an increase of nearly $200,000 over the rate of purchases for the past year.

Helicopter Is Useful In Site Exploration

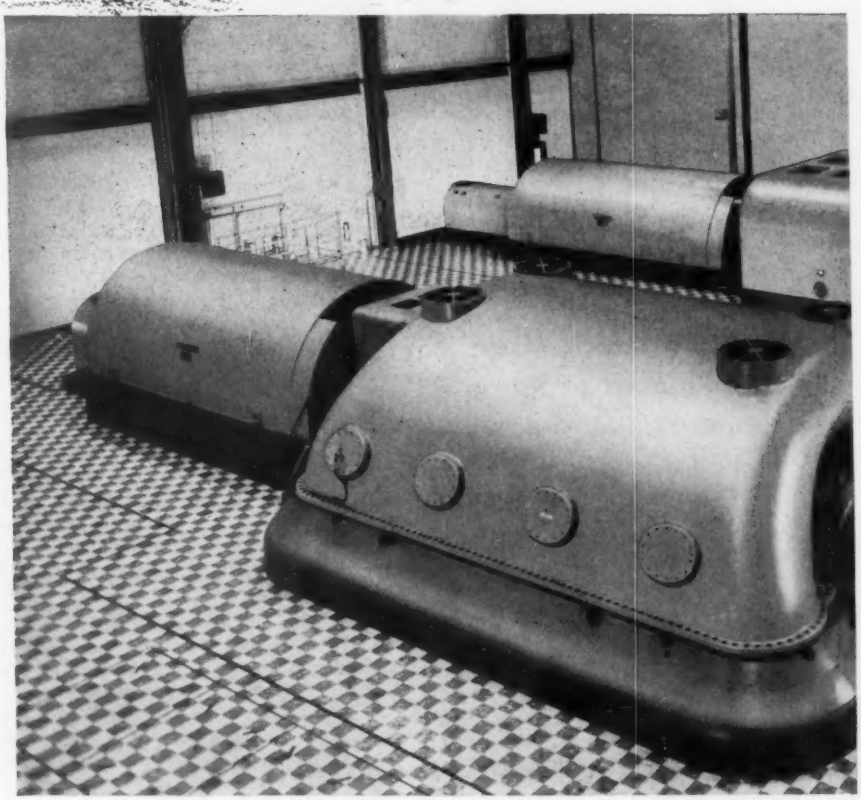
Site exploration at Muddy hydroelectric project area in the high Cascade Mountains of southwestern Washington for Pacific Power & Light Co. is getting an assist from a helicopter to meet equipment and crew transport schedules. In four minutes, Pilot Dean Johnson, McMinnville, Ore., hauls pipe and other drill gear across deep canyons and ridges that would require four hours to traverse by trail pack animals.

The rugged canyon area of the upper Lewis River basin involves the fourth phase development of the Columbia River tributary. PP&L has two power dams, 100,000-kw Merwin and 133,000-kw Yale, in operation, has agreed to joint development of the Swift site's 256,500-kw potential with Cowlitz PUD, and also proposes investigation of the high mountain storage possibilities of a fifth area known as Meadows. The river drains a region west and south of two Cascade peaks, snow and glacier-clad Mt. Adams and Mt. St. Helens.

PP&L slashed two heliports out of the wilderness to accommodate Johnson's aircraft. One, already dubbed Muddy International Airport, consists of four large air drums supporting two troughs from which the helicopter plucks its cargo.



OVEC's

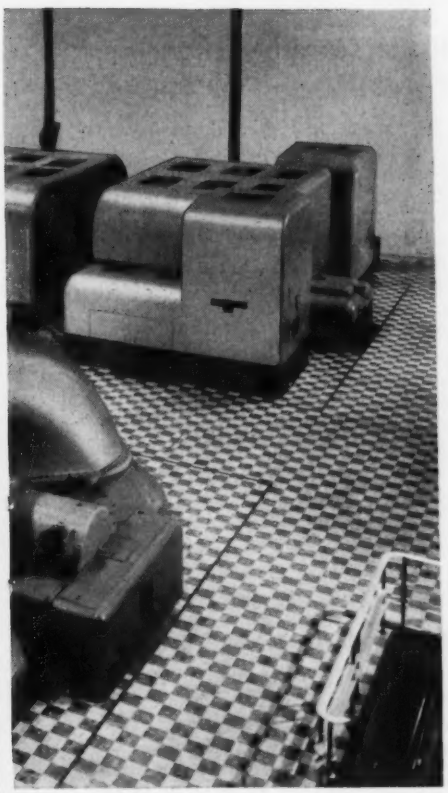


OVEC IS OWNED BY THE FOLLOWING PRIVATE ELECTRIC UTILITIES:

Appalachian Electric Power Company* • The Cincinnati Gas & Electric Company
Columbus and Southern Ohio Electric Company • The Dayton Power and Light Company
Indiana & Michigan Electric Company* • Kentucky Utilities Company
Louisville Gas and Electric Company • Monongahela Power Company** • Ohio Edison Company
Ohio Power Company* • Pennsylvania Power Company*** • The Potomac Edison Company**
Southern Indiana Gas and Electric Company • The Toledo Edison Company • West Penn Power Company**

*Subsidiary of American Gas and Electric Co. **Subsidiary of The West Penn Electric Co. ***Subsidiary of Ohio Edison Co.

Kyger Creek Station



...best heat rate in the nation for 1955!

In the fast-moving race to higher and higher station efficiencies, Kyger Creek Plant of the Ohio Valley Electric Corporation placed first for the year 1955 according to figures released by the Federal Power Commission. The official rate was 9110 btu/kwhr.

Four of the five Kyger Creek turbine-generators are Westinghouse cross compound, double flow, rated 217,260 kw.

J-50591

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU**!*

INDIANA STEEL & WIRE CO.
Crapo
Galvanizing
MUNCIE, IND.
Signs along the lines of
Crapo GALVANIZED STEEL STRAND PERFORMANCE
For dependable performance . . . insist upon Crapo Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes Crapo Steel Strand first choice for guys, messenger and overhead ground wire.
The famous Crapo galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.
• Low maintenance cost
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• Contact your Crapo Jobber Today!
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EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

EVERSTICK ANCHORS

For new construction and maintenance —Everstick Anchors speed up work and provide dependable anchorage on all types of jobs. Made of resilient, rust resistant malleable iron. The toughest anchors made. Write for bulletin.

EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

Sultan River Project May Be Built Jointly

Officials of the city of Everett, Wash., and the Snohomish County PUD, with headquarters at Everett, are considering joint construction of a dam on the Sultan River east of Everett.

Water stored behind the dam would be used by the PUD to generate power and by the city to meet the water needs of industry and homeowners. The city has water rights to the stream but the PUD, which has eyed the site for several years, is in a better financial position to pay for construction.

Wyoming Cooperative Plans Area Expansion

Washakie Rural Electric Co. of Worland, Wyo., has applied to the Wyoming Public Service Commission for authority to provide power to a 13-section area south and east of Worland.

The area is in the Highland-Hanover Irrigation District and the Upper Bluff Irrigation District, part of which will be opened to farming in the spring of 1957.

The territory was originally allocated to Mountain States Power Co. and subsequently the franchise went to Pacific Power & Light Co. when the two firms merged.

San Diego Firm Buys Site for New Station

First unit of a new generating station in the South Bay area of San Diego will be in operation by 1960 or 1961, according to H. A. Noble, operations vice-president of San Diego Gas & Electric Co.

The company purchased 145 acres of land fronting on San Diego Bay on the San Diego-Chula Vista border.

The first unit will have a generating capacity in excess of 100,000 kw, and will be a conventional steam turbo-generator.

Ice Harbor Construction Halts Snake Navigation

With work started on Ice Harbor Dam on the Snake River, navigation is to be curtailed until completion.

Col. Myron E. Page Jr., Walla Walla district engineer for the Corps of Engineers, said power from the project will be on the line by 1961, which meets the approval of navigation interests.

Federal Agencies Give Columbia Compact Okay

Federal agencies have approved all provisions of the revised draft of the Columbia Basin Compact, according to H. Calvert Anderson, secretary of the compact commission.

He said the revisions alter priorities for water consumption to protect large federal installations in downstream states while allowing adequate supplies for upstream states.

The other major change from the original draft expands the term "major states" as commission members, and prevents the possibility of the five upstream states outvoting the two downstream states, Washington and Oregon, in matters involving water resources in the Columbia River Basin.

The revised pact must be approved by legislatures of Idaho, Nevada, Utah, Washington, Oregon, Montana and Wyoming. It must then be ratified by Congress before taking effect.

Rocky Reach Rehearing Turned Down by FPC

A request for a rehearing on the Federal Power Commission license granted Chelan County PUD to build Rocky Reach Dam has been denied by the FPC.

Douglas County PUD made the request claiming that its compensation for lost power potential at the Wells site should be 80%. FPC had granted compensation of a maximum 22,500 kw, or one-half the loss of potential caused by enroachment on the Wells location.

FPC denied the rehearing request on the ground it contained no new facts or legal points that had not been considered or should be. The compensation order is in Chelan PUD's license for Rocky Reach.

New Unit at McNary Goes on the Line

McNary Dam's generator No. 13 went on the line Sept. 5 to bring the capacity of the plant to more than 1,000,000 kw. Only one more unit is scheduled for installation under present plans, and it is supposed to begin producing electricity Dec. 1.

The 13 units in operation are taking the full flow of the Columbia River in the present low-water period, plus drawing down the reservoir.

The first 12 units were manufactured by General Electric Co.; the last two by English Electric Exporting & Trading Co.

Titan's

Proven and Tested

"BUY APPEAL" FEATURES

now come in

HIGH WATTAGE HEATERS

Titan's new HI-WATT Heaters with Therm-O-Dial Control, smart styling room penetrating heating efficiency *and full 10 year guarantee**

Titan makes a streamlined beauty out of a "work-horse" heater . . . for Titan's HI-WATTS are built for work. Yes, built to fill the room with clean, draftless convection heat. And with the superb heating efficiency HI-WATT Heaters offer all the important convenience giving, safety approved features that have made TITAN HEATERS the volume heater line of America.

• • •

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Titan HI-WATT HEATERS

*TITAN 10 YEAR ELEMENT GUARANTEE: The elements of the HI-WATT Heaters are unconditionally guaranteed for 10 full years of trouble free service. TITAN open elements are specifically incorporated into the HI-WATT Heater's design because they heat faster, give more radiation and optimum heating efficiency.

THERM-O-DIAL CONTROLS: Set it . . . then forget it for the accurate, precise built-in thermostat control keeps the room always in the "comfort-zone". Automatically, the Therm-O-Dial Control turns heater on and off keeping room at the desired pre-selected heat.

TEMPERATURE LIMIT CONTROL: This special safety feature insures against excessive heat concentrating inside the heater case. In the event it is inadvertently tipped over, or the air circulation is impeded or impaired the heater turns itself off instantly and automatically.

EVER COOL CASE: TITAN'S unique construction design enables the heater case to remain cool to the touch regardless of hours of operation. Proof — that all heat is projected into the "comfort-zone", none is trapped and wasted within the heater.

TWO-TONE PEARLIZED FINISH: The finest materials and pigments are baked on to resist chipping and cracking and give TITAN HI-WATT Heaters a beautiful, smooth, satiny two-tone finish.

SUPER-SILENT FAN AND MOTOR: A powerful, yet silent operating motor and wide blade fan assure a soft, draftless, yet positive projection of heated air to all parts of the room area.

LIVE POWER SIGNAL INDICATOR: For added safety, you can always tell at a glance when your heater is on . . . because this signal goes on the minute the heater goes on and stays lighted until the heater is turned off.

UNDERWRITERS LISTING: HI-WATT Heaters — like all TITAN products are tested and listed by the Underwriters Laboratory, the standard of safety of the electrical industry.

Model 66 . . . . . 3,000 watts, 230 volts, 60 Cycle AC
Model 67 . . . . . 4,000 watts, 230 volts, 60 Cycle AC
Model 68 . . . . . 4,600 watts, 230 volts, 60 Cycle AC

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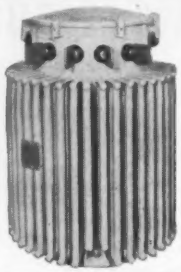

★ Will replace any single phase 75 or 100 Kva Pole-mounted Transformer to provide 67% to 123% more capacity.
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The 24th Annual
MANUFACTURERS'
DIRECTORY

The Manufacturers' Directory lists, free of charge, manufacturers of electrical equipment, appliances and supplies, their Western Offices and their Western representatives. It also includes a directory of manufacturers' representatives handling electrical lines. This Directory is published each year as a supplement to our regular November issue.

ELECTRICAL WEST
68 Post Street, San Francisco 4, Calif.

NEWS ABOUT PEOPLE

Robinson Takes Post As Engineering Editor

Jack Robinson joins the ELECTRICAL WEST staff this month as engineering editor, assuming the duties of the late Walter C. Heston.

Coming from General Electric's service engineering and industrial and utility sales activities in San Francisco, Robinson is already known by many ELECTRICAL WEST readers.

Robinson is a native of southern California. He attended San Diego State College prior to entering the Navy, and Arizona State College, UCLA and USC while in the service. He was graduated from the University of California after World War II and joined G-E immediately after.

With G-E he had assignments in power and electronics and then in personnel work, planning training programs, and recruiting. Following this, he was assigned to sales in the transformer division and from there went to advertising and sales promotion.

Robinson is a member of the American Institute of Electrical Engineers and the San Francisco Electric Club.

Robinson

• **James R. McDonald** is a new field engineer with Line Material Co. He will headquarter at Boise to cover southern Idaho and eastern Oregon.

• **William V. Holik** was elected president of El Paso Electric Co. recently. He succeeds the late **F. Carter Womack**, president for nine years.

• **Jack A. Wright,** a former resident of Raleigh, N. C., has joined the engineering department of the Washington Water Power Co. as a special projects engineer. For 10 years he was employed by the Puget Sound Power & Light Co. in western Washington, leaving in 1946 to join the staff of the Tidewater Power Co. of Wilmington, N. C. When Tidewater merged with the Carolina Power & Light Co. in 1952, he was system planning engineer.

• **Frank J. Bader** is new Western division manager of Combustion Engineering Inc., succeeding **Robert M. Hatfield** who returns to New York as vice-president and general sales manager of the company. Bader will headquarter in Los Angeles.

• **George E. Colley** Jr. was recently elected executive vice-president and director of Pacific Bechtel Corp., an affiliate of Bechtel Corp. Colley, a senior vice-president and director of Bechtel Corp., is a veteran of more than 25 years with the company, and holds directorates and offices in a number of affiliated corporations. **M. E. Harper** and **E. P. Kransfelder** were also elected vice-presidents of Pacific Bechtel by the board of directors.

Waggoner

• **Raymond M. Waggoner,** vice-president, Pacific Coast sales for Hubbard & Co., has been appointed vice-president and general manager of Pacific Coast operations. He succeeds the late Marshall Lasher. Waggoner started with the company in 1922 and has had executive sales positions in the Northeastern division and Midwest division, and served four years as vice-president in charge of sales. He came to the Pacific Coast in 1952.

Can you more than triple the "life expectancy" of equipment?

Yes...and here's how Shell men and techniques help you do it with an inhibited insulating oil

Shell Research men knew that oil oxidation was the villain in much equipment deterioration. So they set out to develop an oil which would effectively "fight" oxidation—main cause of harmful acids and sludge.

To find the *perfect combination,* Shell scientists teamed and tested hundreds of specially-refined base oils with Shell's own oxidation-inhibitor. The one combination that proved *outstanding* was SHELL DIALA OIL AX.

This remarkable insulating oil resists oxidation so effectively, many users report it is still acid and sludge-free years after ordinary oils would have failed. Because of this you can get 3 to 5 times the usual service life on your electrical equipment—without frequent oil purification and costly maintenance.

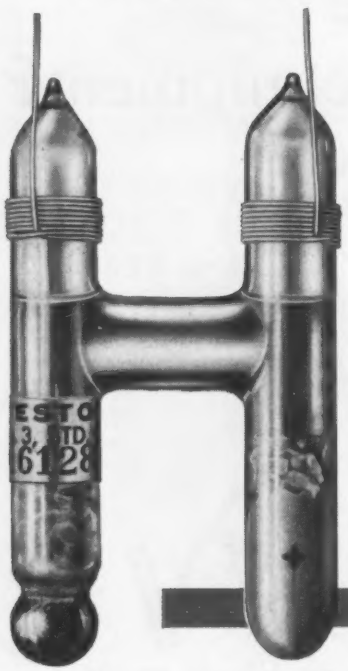
First—and proven *best* in its field—SHELL DIALA OIL AX is just one of many fine products developed by Shell's 1500-man research team, a team with 25 years' experience in gasoline and lubrication problems.

A telephone call can put this team to work solving your problems. Call in your Shell representative today.

SHELL

SHELL DIALA OIL AX

DRIVER-HARRIS ALLOYS AT WORK IN PRODUCT ADVANCEMENT



HOW TO BE SURE A VOLT IS A VOLT...

The Weston Standard Cell Comparator Model 1000, made by Weston Electrical Instrument Corp., Newark, N. J., with associated milliameters, dry cells, main galvanometer, and auxiliary standard cell.*

This H-shaped object, the saturated or "normal" form of the Weston Standard Cell, is the standard reference for electrical measurements. It is essentially a mercury cadmium wet cell hermetically sealed in glass. When kept at 20 degrees C., it maintains its voltage of 1.018636 volts for years. A bank of these cells at the Bureau of Standards in Washington, kept under oil at a constant temperature, is the basic electrical standard of the United States. This, however, is not the cell used by scientists and engineers in their daily work. Since the normal cell must be maintained at a constant temperature for accurate results, the unsaturated or "working" cell, which is portable and is not materially affected by temperature, is ordinarily used.

These working cells must be periodically checked against a bank of normal cells through the use of a comparator system. In the past only a few comparators existed outside the Bureau of Standards. However, the Weston Electrical Instrument Corporation has produced a simplified Standard Cell Comparator which provides the user of working cells, in conjunction with this own bank of temperature controlled normal cells, with an accurate means of standardizing these right in his own plant . . . at a great saving in time, cost and convenience.

THE WESTON COMPARATOR

The Weston Standard Cell Comparator is a specialized potentiometer wherein the voltage of a working cell under test is opposed to that of a normal cell to produce a voltage difference which, when added algebraically to the normal cell voltage, indicates directly the voltage of the cell under test. With a known normal cell voltage as a reference, the Comparator will measure to well within 5 microvolts the open circuit voltage of any cell in good condition.

With an instrument calibrated to such excellent accuracy as this one, it is worthy of note that Weston uses Driver-Harris Manganin wire for critical resistance networks in its system. Says Weston: "The success of the entire circuit, given accuracy of adjustment, depends upon the permanency of the Manganin, and upon its extremely low temperature coefficient of resistance and its low thermal emf to copper".

Your work may or may not need the extreme degree of accuracy that is a prerequisite here. Either way, Driver-Harris has an alloy that can reliably fill your needs. Manganin is only one of 112 special purpose alloys, produced by Driver-Harris. And each of these was originally custom-made . . . produced exactly to the specifications of someone who needed it. Put your specifications in our hands. You will gain the benefits of the 57 years of experience which has developed the largest variety of alloys ever made by any one company.

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MAKERS OF THE MOST COMPLETE LINE OF ELECTRIC HEATING, RESISTANCE, AND ELECTRONIC ALLOYS IN THE WORLD

• **W. M. Jacobs** has been elected vice-president of Pacific Lighting Corp., San Francisco. He will retain his positions as vice-president and assistant general manager and a director of Southern California Gas Co., a Pacific Lighting subsidiary.

• **B. A. Weiss,** of the Imperial Irrigation District, has been elected chairman of the San Diego Section of the American Institute of Electrical Engineers. **L. L. La Zelle** will serve as vice-chairman and **M. R. Marston,** General Electric Co., will be secretary-treasurer.

• **Wayne F. Mulcock** is industrial director, business development department, for Utah Power & Light Co. He will serve as consultant to UP&L personnel in all divisions and to industrial customers.

• **Joe M. Phillips** is new division manager for the Olympia division of Puget Sound Power & Light Co. He succeeds **Frederick H. Anderson** who retired after 48 years with the company.

• **Veryl Hoover,** assistant vice-president of Pacific Power & Light Co., has been appointed general manager of the company's Wyoming division. He succeeds **Dave Johnston** who retired July 1.

Sullivan

• **George E. Sullivan,** vice-president in charge of operations for Portland General Electric Co., whose career spans almost the life of modern electric utility service in the Oregon metropolitan area, retired recently.

He first worked for predecessor companies as a summertime water boy on construction of the hydroelectric station at the falls of the Willamette River at the time his father, T. W. Sullivan, was hydraulic engineer. The son's 54 years of service exceeds the father's by four years.

Chaffin

Jarrett

• **Leo F. Chaffin** is appointed to a newly created Portland General Electric Co. position of assistant general sales manager, **Chester W. Jarrett** is manager of illumination sales and **Frank G. Mackaness** is manager of rural services. Chaffin is assistant to Carrol W. Brissenden, general sales manager, and is responsible for commercial, industrial and illumination sales activities.

• **Lance H. Whittaker,** former Victoria, B. C., newspaperman, has been named public relations director for the B. C. Power Commission, with headquarters at Victoria.

• **Robert D. Yoemans,** a Seattle attorney and member of the Washington State Public Service Commission, has been appointed secretary of Washington Water Power Co. He succeeds **Benjamin J. Lindsay** who retired Sept. 30 after 26 years with the company. Yoemans has submitted his resignation from PSC.

Deaths

• **Harold O'Brien,** well-known sales representative for Square D Co., died Sept. 10 at his Oakland home. He had retired July 1, 1955, from Square D sales activities after 18 years service. Prior to joining Square D, he was in sales for T. L. Rosenberg Electric Co., and before that had worked a number of years for Westinghouse Electric Corp. Mr. O'Brien was a native of Kalamazoo, Mich., but spent most of his childhood in southern California. He began his long career in the Western electrical industry in 1924 when he joined Westinghouse. He was a past-president of the East Bay Electric Club and member of AIEE.

• **Norris E. Lunde,** 54, supervisor of printing and stationery for the Puget Sound Power & Light Co., died Sept. 7 at Seattle. He had been with the company 11 years, much of that time as a senior accountant. He was previously with the Northern State Power & Light Co., Minot, N. D., for more than 18 years.

• **Wilbur L. Sharp, 66,** retired rate engineer for Portland General Electric Co., died suddenly at his home on June 23.

• **James W. Bryan,** 82, chairman of the Kitsap County PUD of Port Orchard, Wash., died Aug. 26 at Seattle.

• **Col. George W. Barker,** 71, for many years manager of the Northern California Electrical Bureau, and a former associate editor of ELECTRICAL WEST, died recently at his Santa Barbara home.

Mr. Barker was a valuable member of Western electrical industry, and had a distinguished military career during World War II with Army Engineer service in California and Oregon.

Born in Nashville, Tenn., in 1885, he attended Massachusetts Institute of Technology and graduated from Clark University. He came to San Francisco in 1913 and spent most of the rest of his life in California and in the electrical industry with Allied Industries and also as a manufacturers representative.

• **Isaac Comeaux,** 73, nationally recognized for his knowledge of public utility financing, died Sept. 1 at Seattle. He had been chief Seattle city accountant from 1918 until his retirement three years ago, except for brief periods when he served as assistant administrator of Bonneville Power Administration and as advisor on budget and personnel problems for the U. S. Department of Labor.

NOTES ON THE TRADE

Peterson

• **Robert J. Peterson** has been appointed district sales manager for Four Wheel Drive Auto Co. in Washington, Oregon, Idaho, Alaska and British Columbia, with headquarters at Seattle.

• **William G. Huston** is now Western regional sales manager for Unarco Air Conditioning Products, National-U.S. Radiator Corp. He is at 1260 Mission St., San Francisco 3, Calif.

• **Weston Electrical Instrument** Corp. has opened a new branch sales office and warehouse at 2001 S. Grand Ave., Los Angeles.

• **Paul R. Repath** Inc., Los Angeles manufacturer of electrical steel laminations, metal stampings and deep drawn transformer cans, has been purchased by Allegheny Ludlum Steel Corp. Arnold Engineering Co., an Allegheny subsidiary, will operate the plant as Repath Pacific Division. Paul Repath will continue as head of the division, and no personnel changes are anticipated.

• **General Electric** Co. is going to establish a computer laboratory at Menlo Park, Calif., to be known as the ERMA systems laboratory. It is the first step in a long-range program for expanding advanced engineering facilities in the industrial computer field.

• **Perkin Engineering** Corp., El Segundo, Calif., manufacturer of d-c power supplies, has recently expanded its plant facilities through the acquisition of a new building at 337 Kansas.

• **Western Wire & Cable Co.**, Vancouver, B. C., has opened a new plant at Weyburn, Sask. The plant will have an initial capacity of about 3,000,000 lb of electrical conductor wire annually, and most of this will be aluminum cable for power transmission.

• **Line Material** Co. is going to build a new West Coast production facility at Visalia, Calif. Construction will start about Nov. 1. First production items will be Round-Wound distribution transformers.

• **National Electric Products** Corp. announces that **C. E. Heggs,** sales representative, has been transferred from Denver to Seattle, and **K. F. Whittlesey** has moved from Seattle to Portland.

• **Robert Thallon** has been named director of engineering and operations for Fluorescent Fixtures of California. It is a new position created because of company expansion. Thallon has been a design engineer and then chief engineer of the firm.

• **Atomics International,** a division of North American Aviation Inc., is building new headquarters for manufacturing, purchasing and warehousing operations at Van Nuys, Calif. It will double the present plant area.

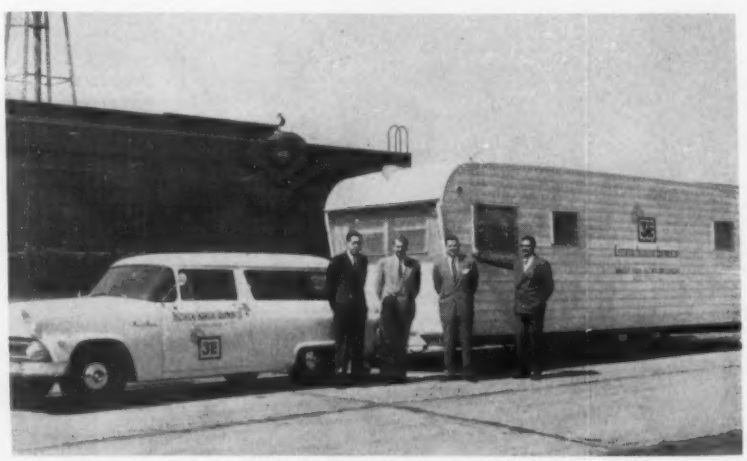
• **Kerite Co.** announces the appointment of **Fred W. Carlson,** manufacturers representative, as its agent in the Pacific Northwest. Carlson offices in Seattle, Portland and Butte will cover the states of Washington, Oregon, Montana and Idaho.

Mackenzie

• **A. E. Mackenzie** has been appointed vice-president and general manager of Kelman Electric & Mfg. Co., Los Angeles, which was recently purchased by I-T-E Circuit Breaker Co. He has been with I-T-E since 1944, most recently serving as district manager in New York. He is a native of Washington, and graduate of the University of Michigan.

• **Eric B. Insley** and **James N. McEntee** have been appointed manager and sales manager of the newly created Los Angeles sales and service branch of the Materials Handling Division, Yale & Towne Mfg. Co.

• **Charles R. Isaacs** is assigned to the Los Angeles district of the Industries Group of Allis-Chalmers Mfg. Co. He moves from Kansas City.



This 42-ft traveling display will soon give Western utility and industrial men the opportunity to examine and operate the switchgear made by Electrical Engineers Equipment Co. The display consists of a complete range of indoor and outdoor equipment, data and pictures of installations. It especially features 3E's metal enclosed indoor load interrupter. The mobile display has already traveled more than 15,000 miles, and has been seen by more than 7,000 people in the east and midwest. Power men will be interested in the unit itself. The rear area of the station wagon houses a 10-kw generating unit

NEW DESIGN BEEFS UP DERRICK. CUTS DOWN WEIGHT

We made this new derrick with legs to please you. Fabricated and rectangular, they weigh 20 percent less than most side legs, yet they're about 25 percent stronger. The "bow-legged" shape keeps the cargo area open.

This derrick lifts 8000 pounds (has been tested at 14,000 pounds), body-loads 2,500 pounds, handles 65-foot poles. Operating range is 195°, and live-boom action gives you infinite lifting positions with a single-drum winch. *Like other Holan derricks, this one fits any body on its own supports. There is no need to rebuild or reinforce the body proper.*

There's much more to tell, so write us and ask about the Series 6700 Power Derrick.

Series 6700 Derrick mounted on Holan CLC-138 Construction Body. Notice new Holan corner window design for crew compartments.

All Holan bodies are made of hi-tensile, rust-resistant steel 20 to 25% lighter than ordinary steels.

Line construction bodies for light to heavy-duty. Crew compartments optional. Efficient tool compartments and drawers.

Service bodies for chassis up to 1½ ton. Lengths, 72", 84" and 102".

Aerial arm for spotting workmen 37 feet above ground, 9 feet below ground level. Double-basket unit extends 45 feet. Rotates 360°.

Live-boom, three-legged derrick lifts 12,000 lbs., 75-foot poles. Body-loads 5,000 lbs.

Mechanical Ladders expertly engineered and counterbalanced for effortless handling. Maximum heights from 24' to 32'. Swings 360°; angles to 72°.

Portable hydraulic and mechanical earth borers. Augers for 8" to 20" diameters, depth to 8'.

Hydraulic jacks, controlled from rear of truck. Rigid mounted or patented Holan self-stowing types.

Live-boom, two-legged derrick with fabricated, rectangular side legs—"bow-legged" design. Lifts 8000 lbs., 65-foot poles.

Live-boom, two-legged derrick with automatic hydraulic side-leg coupling. Lifts 6000 lbs., 70-foot poles.

Ladders to 40' with all phases completely hydraulic. Pump actuated by P.T.O. or separate engine drive with electric starter.

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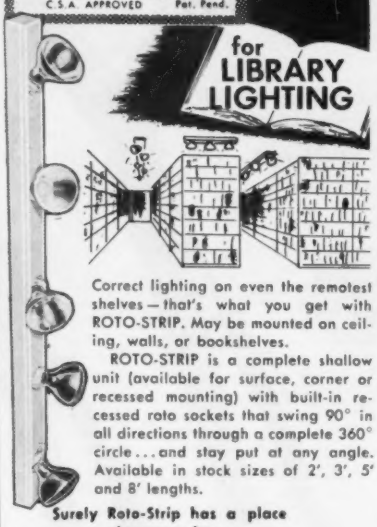

Correct lighting on even the remotest shelves—that's what you get with ROTO-STRIP. May be mounted on ceiling, walls, or bookshelves.

ROTO-STRIP is a complete shallow unit (available for surface, corner or recessed mounting) with built-in recessed roto sockets that swing 90° in all directions through a complete 360° circle . . . and stay put at any angle. Available in stock sizes of 2', 3', 5' and 8' lengths.

Surely Roto-Strip has a place in your plans.

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STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS of March 3, 1933, and July 2, 1946 (Title 39, United States Code, Section 233) showing the ownership, management, and circulation of Electrical West, published monthly at Los Angeles, California, for October, 1956.

1. The names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, McGraw-Hill Company of California.....68 Post St., San Francisco 4, Calif.
Editor, C. W. Leihy.....68 Post St., San Francisco 4, Calif.
Managing editor .....None
Business manager, T. H. Carmody, Jr. .....68 Post St., San Francisco 4, Calif.

2. The owner is: McGraw-Hill Publishing Company, Inc., 330 West 42nd St., New York 36, N. Y. Stockholders holding 1% or more of stock in McGraw-Hill Publishing Company, Inc., are: Donald C. McGraw and Willard T. Chevalier, Trustees under Deed of Trust dtd. 1/14/21, as amended, m/b James H. McGraw, deceased; Donald C. McGraw and Harold W. McGraw as Trustees under Indenture m/b James H. McGraw dated 7/1/37, as amended; Donald C. McGraw, individually; Harold W. McGraw, individually; Elizabeth M. Webster, c/o Donald McGraw (all of 330 West 42nd St., New York 36, N. Y.); Mildred W. McGraw, Madison, New Jersey; Grace W. Mehren, 536 Arenas St., La Jolla, Calif.; Genoy & Co., P. O. Box 491, Church St. Station, New York, N. Y.; Merrill, Lynch, Pierce, Fenner & Beane, 70 Pine St., New York, N. Y.; Touchstone & Co., c/o Wellington Fund, Inc., Claymont, Delaware.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or ther securities: None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required from daily, weekly, semiweekly, and triweekly neswpapers only.)

T. H. CARMODY, JR., Business Manager.

Sworn to and subscribed before me this 19th day of September, 1956.
[SEAL] DOLORES COWLES

Notary Public in and for the City and County of San Francisco, California.
(My commission expires Oct. 28, 1956)

• **Russell E. Bryant** is now manager of the electrical division of Wagner Electric Corp., Los Angeles branch. He succeeds **Leonard G. Tandberg** who retired Sept. 1 after nearly 47 years service.

• **California Electric Supply** Co., San Francisco, is now a distributor for the Ben-Hur Mfg. Co.

• **Jack A. Cairns** has been promoted to the position of supervisor of advertising and promotion, Industrial Truck Division, Hyster Co., Portland.

• **Subox** Inc., paint manufacturer specializing in metal protective coatings for utilities and heavy industry, has recently added a new service. The company has retained George Wallace to assist customers in assembling the proper equipment and to train crews to strip and flow paint on large air-cooled power transformers.

• **General Electric Co.** has announced plans to construct a 14,268-sq-ft office building in Portland to house its apparatus sales division. It will cost $275,000, and is to be adjacent to the apparatus service shop.

• **James W. Mahoney** has been elected president and general manager of Day-Brite Lighting of California. The company also opened general offices at 8421 Wilshire Blvd., Los Angeles.

• **Harry L. Warner** has been named sales manager for Kaiser Steel's Fontana Fabricating Division.

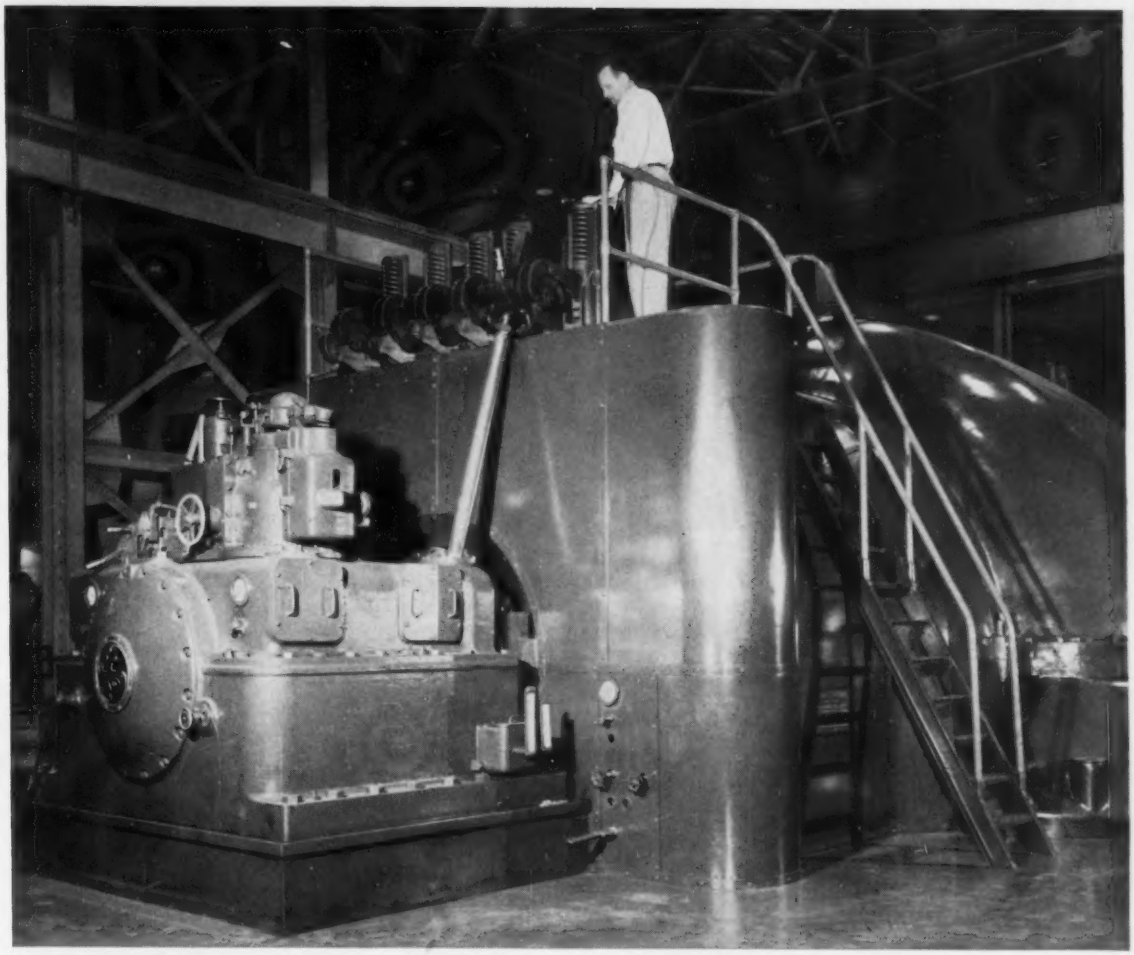
Clark

• **Lyman L. Clark** has been appointed sales manager of Westinghouse Electric's Sunnyvale, Calif., plant. He succeeds **Thomas R. Lawson** who is now manager of the control department in Buffalo, N. Y.

STANDARD ENGINEER'S FIELD REPORT

LUBRICANT CALOL OC TURBINE OIL

FIRM U.S. STEEL CORP. Geneva, Utah

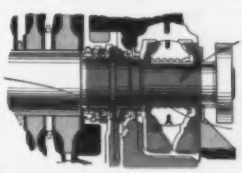


Oil Neutralization No. only .07 after 100,000 hours

After 100,000 hours of operation, Calol OC Turbine Oil in this 50,000-kw turbine-generator showed a neutralization number of just .07—identical with the number of the original 7,000 gallon charge, made in 1943. During regular inspection and servicing periods, Calol OC Turbine Oil was drained, purified and put back in service. No "sweetening" of the oil, and no other down time, was required during entire 100,000 hour period.

This General Electric turbine is the principal source of power for United States Steel Corporation's mill at Geneva, Utah. Mill's four 11,350-h.p. turbo-blowers also use Calol OC Turbine Oil.

Why CALOL OC Turbine Oil prevents sludging, rusting and wear



•Excellent metal-wetting ability keeps oil on bearings and gears under heaviest loads • Oxidation inhibitor prevents sludge, gum, and lacquer formations •Corrosion inhibitor stops rusting

For More Information about Calol OC Turbine Oils call your Standard Representative or write 225 Bush Street, San Francisco 20, California.

TRADEMARK "CALOL" AND DESIGN REG. U. S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA

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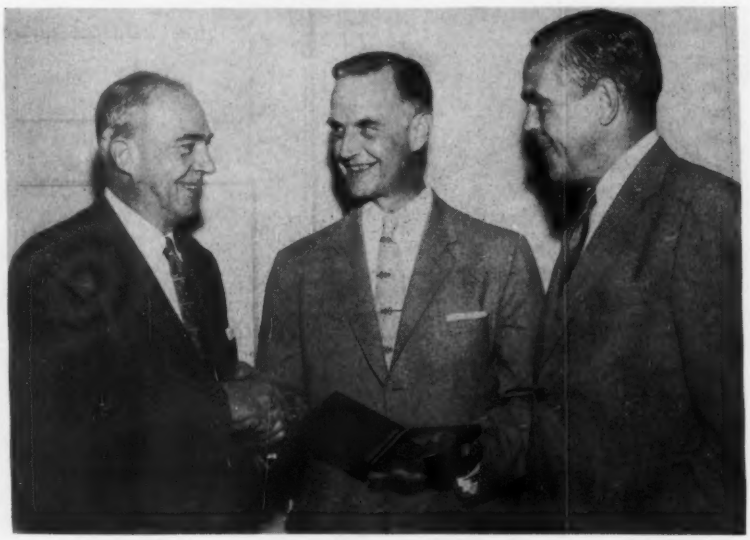
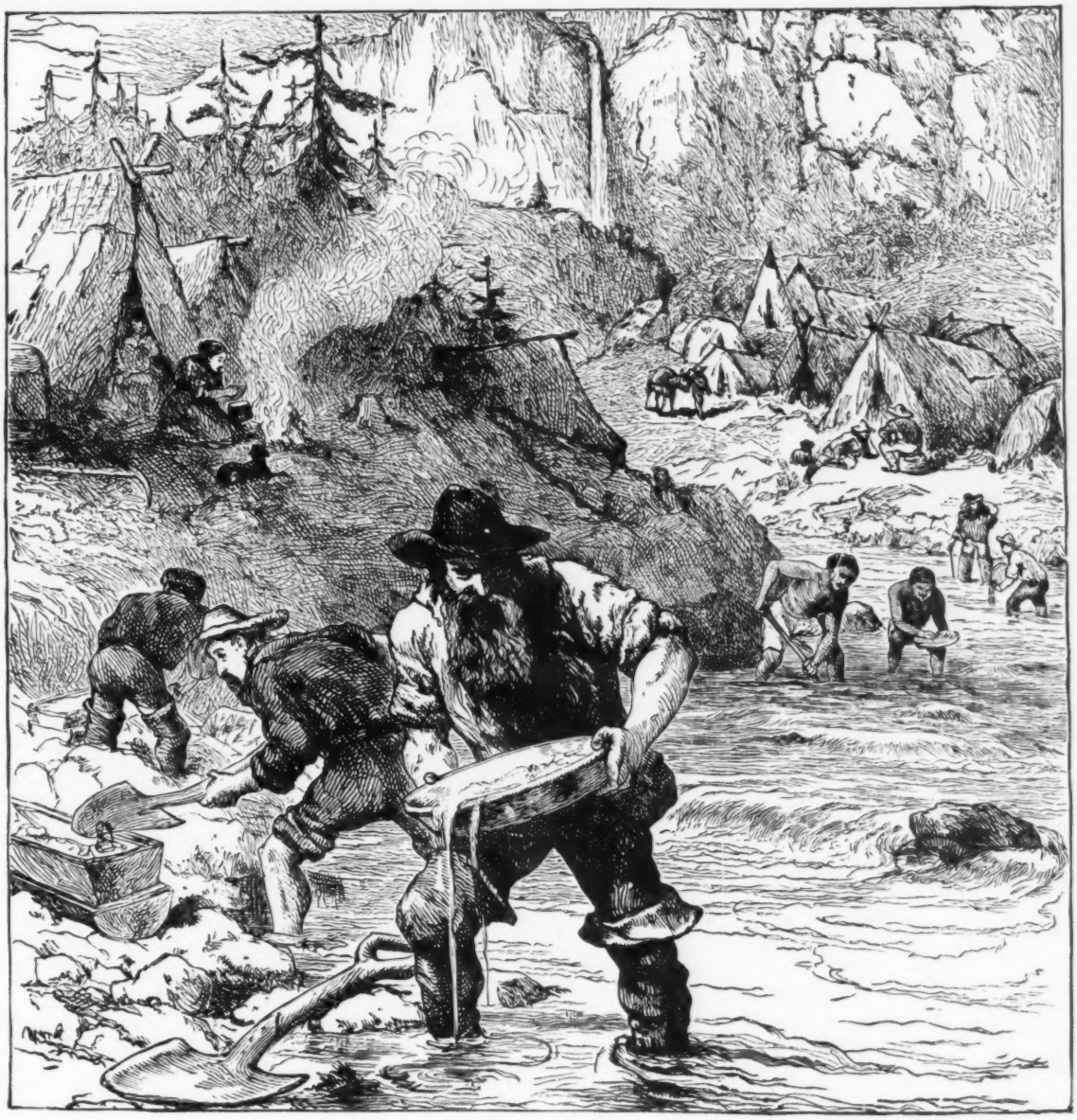


Standish H. Harrison (center) receives the Westinghouse Order of Merit from Walter Maytham, company Pacific Coast vice-president (left); Mark Cresap, executive vice-president, looks on. Harrison is Pacific Coast regional manager for industrial sales. Award is for outstanding leadership for his company

Dr. Robert C. Langford (left), chief engineer of Weston Electrical Instrument Corp., displays the "Vamistor," a new resistance unit that he developed, to W. H. Steinkamp, vice-president of company. The Vamistor was at the Los Angeles Wescon exhibition

Howard Tyler has been selected by Salt River Power District to be superintendent of the new Agua Fria steam power plant. First unit will not start before next April

Don Squire takes over as superintendent of the power district's Kyrene station in the personnel shift preparing for Agua Fria operation. He is Kyrene's plant engineer now



How much gold has been mined in the Golden State?

Since the days of the '49ers, California has mined $2⅓ billion in gold — making it the nation's greatest gold producer! No wonder they call it the Golden State.

Yet, in just the last ten years, *a single* company — Pacific Gas and Electric — has invested two-thirds of that amount ($1½ billion) in new facilities. And we're still expanding!

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410-X-1056

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* Means HOUSEPOWER in Eskimo . . .

No need to tell our fur-clad friend above about HOUSEPOWER. Literally and figuratively he's on top of this world with an adequately wired igloo and a freezer full of polar bear and assorted eskimo pies.

North, South, East and West . . . the word is spreading about HOUSEPOWER . . . *full* HOUSEPOWER. You're missing a bet if you're not taking full advantage of the consumer sales power in *full* HOUSEPOWER. Start putting it to work for you and your business today! Thousands of appliance dealers, distributors, manufacturers, utilities, contractors and bankers are finding that HOUSEPOWER is their key to bigger and better markets and sales.

Write or come in to either of our offices for complete details on the HOUSEPOWER promotion, as well as other PCEA activities.

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